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SURGERY
GYNECOLOGY AND OBSTETRICS

VOLUME 87 SEPTEMBER, 1948 NUMBER 3

EVOLUTION AND TREATMENT OF TUBERCULOSIS OF THE HIP

IGNACIO PONSETI, M.D., Iowa City, Iowa

THE evolution of tuberculosis of the hip joint in patients seen in this clinic has been studied to determine the results of conservative and operative treatment as well as the optimum time for surgery and the efficiency of different surgical operations.

Thirty-one proved cases of tuberculosis of the hip followed for a minimal period of 4 years were chosen for this study. The tuberculous nature of the hip lesion was proved by positive guinea pig reactions to inoculations of abscess material or of tissue from the involved hip. In some instances the Bacillus tuberculosis was found on direct smear or in cultures of this material. Lesions of proved tuberculous nature in the viscera or other osteoarticular regions in patients with hip joint involvement were also considered as proof of the tuberculous nature of the hip joint lesion. Microscopic sections of tissue of the hip joint which showed pathological lesions described as typical of tuberculosis were not accepted as definite proof of the tuberculous nature of the process unless a positive reaction in guinea test was obtained from the same tissues. Granulomatous and necrotic lesions similar to those seen in tuberculosis can be produced by other organisms than the Koch bacillus.

The 31 cases chosen for this study do not represent a true cross section of the different types of hip tuberculosis seen in this clinic. It is usually difficult to prove the tuberculous nature of hip lesions which are of very slow development and show no abscess formation and which develop in patients who are in good general condition and who years before the onset of the hip symptoms had minimal and clinically undetected pulmonary lesions. Many of these patients who had a probable but not proved tuberculous hip necessarily had to be excluded from our series whereas cases of patients with hip lesions of acute onset and stormy evolution were easily proved and many could be included in this study. However, since the diagnosis of osteoarticular tuberculosis is so inaccurate when made on clinical and roentgenographic studies alone, we have preferred to discard all the unproved cases, even if by so doing the statistics do not represent a true picture of the different types of tuberculous hip disease. Many cases in which the follow-up extended over a short period only, or there was no follow-up, were also discarded.

For this study the cases were divided into three groups:

1. Primary para-articular bone lesions—7 patients, all children.
2. Tuberculosis of the hip joint in childhood (under 15 years of age)—15 patients.
3. Tuberculosis of the hip joint originating in the adult—9 patients, 1 with bilateral hip tuberculosis.

From the Department of Orthopedic Surgery, State University of Iowa Hospitals.

a b c

Fig. 1. a, Roentgenogram of the left hip of a 6 year old boy shows an area of uniform bone destruction in the inner aspect of acetabular roof. The patient had mild pain in his left leg and limp for 6 months. Hip motion was somewhat restricted in all directions. Roentgenograms of chest showed a Gohn complex which healed and calcified within 1 year. A diagnosis of tuberculous osteitis of the ilium was made. The patient was immobilized in plaster hip spica for 1½ years. b, Roentgenogram taken 3 years later shows the osteitic lesion practically healed. The patient had been ambulatory for 1½ years and had no symptoms. c, Roentgenogram taken 1 year later shows new activity in the area of the old lesion, and enlargement of the area of destruction. The joint space is somewhat narrow and there is generalized bone atrophy. Seven months before this picture was taken the patient started to have pain again and to limp on left leg. An intra-articular and extra-articular fusion and subtrochanteric osteotomy were done 1 month later. The synovia was moderately infiltrated with tuberculous granulation tissue. The superficial layers of joint cartilage were eroded.

From a pathological point of view there is no sound basis for studying osteoarticular tuberculosis in children in a group separate from the adults. Types of destruction of similar character can be seen in children as in adults because "it is not the age which regulates the different types of osteoarticular tuberculosis but the date of the primary infection" (6). However, it is usually in children in whom we see the most actively destructive lesions because contacts with the Bacillus tuberculosis occur early in life in a great proportion of the population. On the other hand, the anatomical and physiological characteristics of the osteoarticular system and its capacity for repair change with the years. In tuberculosis, as in any other infectious processes of the bones and joints, the evolution of the process varies not only with the intensity of the infection and the ability of the patients' defense to combat it, but also with the age of the patient. We believe, therefore, that we are justified in studying osteoarticular tuberculosis in children as a group separate from the adult.

PATIENTS WITH PRIMARY PARA-ARTICULAR BONE LESIONS

A circumscribed area of bone destruction close to the hip joint was observed in 7 patients, all of them children—5 boys and 2 girls. Their ages at the onset of symptoms varied from 1 to 5 years. In 3 patients the lesion was localized in the femoral neck, close to the metaphysis, whereas in the other 4 patients the lesion was located in the ilium, close to the roof of the acetabular cavity. No primary foci of osteitis in the femoral head were encountered. The lesions of the greater trochanter were not included in this study. Five of these patients were treated by prolonged immobilization in plaster hip spica and 2 were operated upon when they were first seen in our clinic, 7 and 10 months after the onset of symptoms.

There are two different types of tuberculous osteitis which can be differentiated in the roentgenograms and at biopsy. In 3 of our patients (Figs. 1 and 5) the roentgenograms showed an area of uniform bone destruction surrounded by no, or moderate, bone sclerosis,

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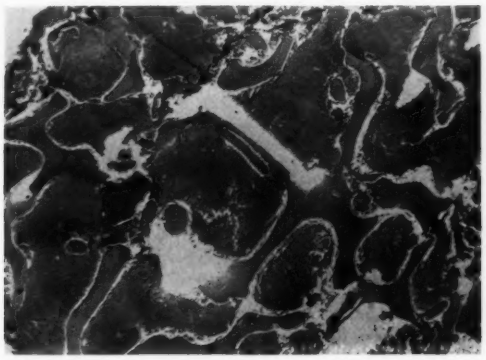

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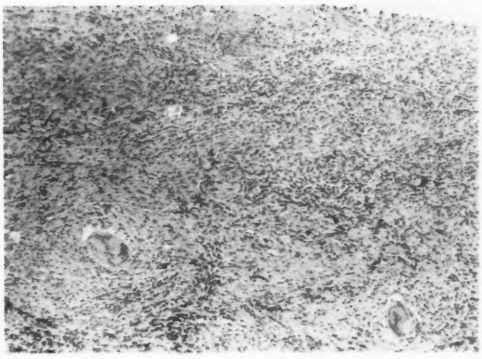

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Fig. 2. a, Roentgenogram of the right hip of a 6 year old boy. There is a focus of irregular bone destruction in the inner aspect of the femoral neck. The head of the femur is somewhat separated from the inner wall of the acetabular cavity. Seven months previously, following a fall, the patient awoke at night screaming with sharp pain in right hip. This pain reappeared periodically. He had a limp due to pain and to flexion contracture in the hip. b, The lesion in the femoral neck consisted of an extensive area of primary caseation necrosis containing sequestrated bone. c, The synovia in the lower aspect of the joint was very thick and contained abundant tuberculous granulation tissue with no caseation. The guinea pig test was positive for tuberculosis.

depending on the age of the lesion. An area of surrounding sclerosis represents limitation of the process which appears when the lesion has already been present several months. Biopsy in one of these lesions revealed tuberculous granulation tissue occupying the marrow spaces and eroding and destroying the bone trabeculae. Small areas of caseation were very scarce in the granulation tissue.

In the 4 remaining patients, the roentgenograms showed the area of bone destruction to be partially filled with one or several dense bone sequestra of different size and shape (Figs. 2, 3, and 4). A wall of dense bone was seen surrounding this area. The biopsy in 2 of these cases showed these sequestra to be formed by dense trabeculae of dead bone. The marrow spaces were occupied by caseated marrow tissue with some of its structures still faintly discernible in places, indicating that the lesion represented a primary caseation of the marrow (Fig. 2b). Surrounding the sequestra were caseated material and debris with a few scattered areas of tuberculous granulation tissue, polynuclears, and chronic inflammatory cells. The first type of lesions was designated granulous osteitis, because of the abundance of tuberculous granulation tissue. The last type of lesions is called caseous osteitis because of the abundance of primary caseation necrosis of the marrow tissues (6, 10, 11).

In most children there was a tendency for both types of tuberculous osteitis treated conservatively to become limited and walled off. The bone sequestra were slowly destroyed and later new bone trabeculae filled in the cavity (Fig. 4). In a few years the old lesion had disappeared from the roentgenograms. In certain cases, however, the lesion reap-

Fig. 3. Roentgenogram of a 4 year old girl. Seven months previously the patient started to limp and to have marked and continuous pain in the left hip. The chest was negative. Biopsy showed an extensive focus of caseous necrosis in the ilium containing a large bone sequestrum. The guinea pig test was positive for tuberculosis.

peared and even enlarged when immobilization was discontinued and weight bearing and freedom of motion were resumed. Even if the primary focus of osteitis disappeared completely, the hip joint in each of the 7 patients was affected sooner or later by the tuberculous process regardless of treatment. It was very difficult from clinical and roentgenographic examinations to ascertain when the hip joint was first invaded by the spreading of the focus of tuberculous osteitis. We have never seen a patient with a focus of osteitis adjacent to the hip joint complaining of only osteocopic pain, but invariably pain of arthritic character was present on admission. The patient may have occasional pain in the hip, and a slight limp, and he often cries at night. On clinical examination a few degrees of limitation of motion are noted and pain accompanies extreme degrees of motion. The roentgenograms show a localized osteitis with a seemingly normal hip joint. However, when biopsy is done at this time the synovia adjacent to the bone lesion is found already invaded by tuberculous granulation tissue (Fig. 2).

Further joint involvement may proceed in a slow, progressive manner or the joint may become rapidly destroyed a few months after the onset of the osteitic lesion. In 3 of our patients roentgenographic evidences of joint destruction were not seen until 1½ to 4½ years after the onset of symptoms. The roentgenograms later on showed further narrowing of the joint space with some marginal bone destruction, atrophy and irregular minimal spotty destruction of the subchondral bone, and generalized bone atrophy. The limitation of motion in the hip progressed, the hip pain became more continuous, the child limped markedly, and flexion and adduction contractures of the hip joint developed and progressed slowly. One patient had sharp increase of pain and some fever 4 years after onset of symptoms. The roentgenograms, which had been showing a slowly progressive joint destruction, revealed marked increase of bone destruction a few weeks after the acute episode, a wandering acetabulum, and extreme bone atrophy (Fig. 4). The pathological examination of the joints which were slowly destroyed by the tuberculous process showed the synovia replaced by thick tuberculous granulation tissue with many typical tubercles present. Caseation of the tubercles was very rare. At the joint margins, granulation tissue formed a pannus creeping over the joint surface and eroding the joint cartilage. The subchondral bone showed osteoporosis and nonspecific granulation tissue was slowly destroying the bone cartilage from underneath. Very rarely were miliary tubercles found in the subchondral spaces. Overgrowth of hyaline and fibrocartilage was seen at the periphery of the joint in one instance (Fig. 6).

In 4 of our patients the hip joint was involved and rapidly destroyed only a few months after the onset of symptoms from a para-articular focus of osteitis. In 2 of these patients the joint was involved following biopsy and removal of the focus of osteitis, 7 and 10 months after the onset of symptoms. The joints in both cases were completely destroyed after a few months of a stormy postoperative course with fever, pain, increased sedimentation rate, and elevated white blood count. In the other 2 patients the joints became ostensibly involved, as seen on the roentgenograms, and were rapidly destroyed 2 and

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d e

Fig. 4. a, Roentgenogram of the left hip of a 22 month old boy taken on September 23, 1940. It shows a focus of osteitis in the femoral metaphysis containing one sequestrum. The child limped on left leg when he began to walk at 11 months of age. Occasionally complained of pain in the hip, which was in 30 degrees' flexion contracture. The patient was immobilized in plaster hip spica. b, Roentgenogram taken on May 16, 1941 shows that the bone sequestra are being absorbed. The joint space is somewhat narrow. Later on the patient was symptomless and began to walk in July, 1943. Half a year later he developed flexion contracture in same hip. c, Roentgenogram taken on May 1, 1944 shows the lesion of the femoral metaphysis to be healed. However, the upper joint space is narrow and the femoral head is separated from the inner wall of the acetabular cavity. Subchondral cystic destruction is seen in the femoral head. The patient was again immobilized. d, Roentgenogram taken in July, 1945 shows advanced destruction of the femoral head and acetabular roof. e, Roentgenogram taken on January 14, 1946, 6 months after a Brittain operation. The bone graft is seen eroded and fractured. A soft tissue abscess is present medial to the upper femoral shaft, at the site of the bone graft. Guinea pig test was positive for tuberculosis. The patient is still under treatment.

5 months after the onset of symptoms due to the fast spreading of the focus of osteitis (Fig. 5). The joint invasions in these cases were characterized by very acute clinical symptoms such as an extreme amount of pain, high temperature—103 degrees, complete fixation of the joint due to muscle spasm, elevated white blood count, elevated sedimentation rate, and low hemoglobin. Great destruction of the femoral head and of the acetabular roof could be seen a few months later in the roentgenograms. The pathological examination in one of these patients showed the predominance of caseation necrosis in the synovia and in the subchondral bone, with destruction of the joint cartilage.

According to our experience, the type of pathological lesions seen in the involved joint was not always of the same character as in the lesions found in the original focus of osteitis. Biopsy in 2 patients, for example, with an extra-articular tuberculous focus, showed the bone lesion to be a caseous osteitis, as it was formed by bone sequestra surrounded by caseated marrow with no tubercles. The synovia adjacent to this focus of bone destruction showed, on the other hand, tuberculous granulation tissue with typical tubercles and no caseation (Figs. 2 and 3). However, the joint became rapidly destroyed in both cases after caseous material was implanted into the joint at the time of operation.

The causes for the predominance of the caseous or the granulous type of lesions in tuberculous osteitis and osteoarthritis are obscure but probably are related to changing allergic

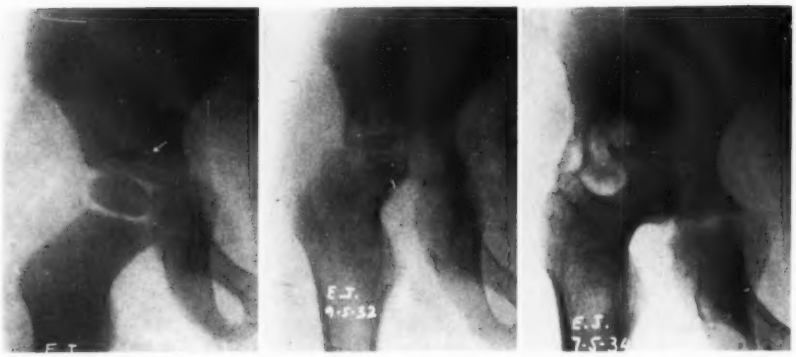

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Fig. 5. a, Roentgenogram of a 3 year old boy showing a small area of destruction in the acetabular roof. The patient had mild pain in the right hip and knee for 1 month. Shortly after this roentgenogram was taken the patient fell and injured the right hip. After that he started to have high temperature and a great deal of pain in the same hip. The osteitic lesion had opened into the hip joint. The patient was then immobilized in hip spica cast. b, Roentgenogram taken 10 months later. The hip joint had been destroyed. A new acetabular roof is already delimited. c, Roentgenogram taken 2 years later, just before surgery. What was left of the femoral head and acetabulum appear well reossified. The joint space is very wide and contains several sequestra. The patient died of shock shortly after surgery. Examination of the hip showed the joint space to be occupied mostly by hyaline cartilage and fibrocartilage. A few pieces of dead bone are being destroyed by granulation tissue. Areas of caseation necrosis partially calcified were seen here and there. A few tubercles surrounded by concentric layers of fibrous tissue were also seen.

conditions in the patient (6). However, it must be emphasized that only in the early stages of osteitis or synovitis can pure caseous or granulous lesions be found. These two types of tuberculous lesions will be seen intermingled sooner or later in any tuberculous process, although one of the lesions will predominate over the other (5, 9).

According to our experience, once the hip joint became involved, it either fused spontaneously or a fusion operation had to be performed. This was necessary because of persistent pain, increasing joint destruction, and flexion and adduction contractures. Four patients were treated by prolonged immobilization in plaster casts—two hips became ankylosed 3 years after onset of symptoms due to the focus of osteitis and approximately 2½ years after the joint invasion. The other 2 hips did not become ankylosed until 3½ and 5 years after the joint invasion. Obviously, the joints rapidly destroyed by a caseous process became ankylosed faster than the joints which were slowly destroyed by a granulomatous type of lesions. Three patients were operated upon. A Brittain fusion was performed in 1 patient 5 years after the onset of symptoms and failed because of absorption of the bone graft; this patient is still under treatment. An intra-articular and extra-articular fusion, plus a subtrochanteric osteotomy has been performed recently in another patient 5 years after the onset of symptoms. An extra-articular fusion was performed in 1934 on another patient, 3 years after the joint invasion. The patient died of shock shortly after the operation.

The following observations taken from this study concerning the evolution of tuberculous para-articular foci about the hip joint are in agreement with those in most of the reports in the literature.

1. Extra-articular foci of osteitis are seen more often in children and very rarely in adults.

2. The femoral head is almost never involved by a primary focus of tuberculous osteitis.

3. The hip joint becomes involved sooner or later in the great majority of patients, regardless of whether the treatment of the focus of osteitis has been conservative or operative.

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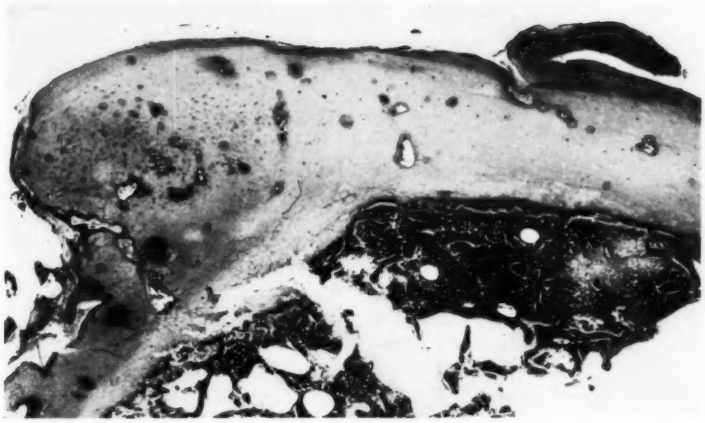

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Fig. 6. a, Roentgenogram of the right hip of a 4 year old boy taken in October, 1931. There is atrophy of the upper femur and pelvis, and an area of bone destruction with irregular, dense calcification is seen in the femoral neck. The patient limped and had pain in right knee and hip for 5 months. The right hip was in marked flexion, abduction, and outward rotation contracture. The right leg was placed in traction and later in a hip spica plaster cast. b, Roentgenogram taken 2 years later shows that the lesion in the femoral neck has been displaced distally, due to the growth of bone at the epiphyseal plate. The contours of the lesion are less sharp. The upper femur is very atrophic and the joint capsule is distended. The femoral head is somewhat flat and the subchondral bone is irregular. c, Roentgenogram taken 4 years after onset of symptoms. The lesion of the femoral neck has disappeared. The joint space is narrow. There is a new area of bone destruction in the outer aspect of the femoral head. Biopsy and exploration of the hip were performed at this stage. d, Represents the outer margin of the femoral head. There is overgrowth of hyaline cartilage at the area of bone destruction seen in the roentgenogram. A pannus formed of granulation tissue and fibrous tissue was covering the surface of the joint cartilage (the wrinkling of the pannus is an artefact). There is chronic, and for the most part nonspecific, granulation tissue in the marrow spaces of the subchondral bone. The capsule was thickly infiltrated by tuberculous granulation tissue with many typical tubercles. Caseation of the tubercles was rarely seen. Guinea pig inoculation was positive for tuberculosis.

Hatcher and Phemister reported that in only 2 of 26 children did the lesion, which was centrally located in the femoral metaphysis, heal without joint involvement. Cholmeley reported that of 55 patients only 3 recovered with an intact hip joint; 1 had a focus of osteitis in the greater trochanter which was removed surgically and in the 2 others the lesion was localized in the ilium over the cotyloid rim and in the medial wall of the acetabulum.

From these findings we know, then, that the focus of tuberculous osteitis about the hip joint will take years to heal if conservative treatment with plaster cast immobilization is employed, but in spite of this treatment the joint will become involved in the great majority of cases. Drainage and curettage of the focus of osteitis will not save the joint either unless the focus is located in the greater trochanter or occasionally in the ilium at some distance from the hip joint. Based on this experience, we believe that treatment of the focus of tuberculous osteitis close to the hip joint must be directed toward obtaining an ankylosed joint as soon as there is clear evidence that the destructive process of osteitis remains well localized and the general condition of the patient is satisfactory. Care should be taken not to disturb the focus of osteitis, a step easily accomplished when the focus of osteitis is located either in the medial aspect of the femoral neck, ischium, or in the middle aspect of the ilium. However, if the focus of osteitis is located in the lateral aspect of the femoral neck or of the acetabulum, a hip fusion operation will necessarily disturb the osteitic lesion and the tuberculous process may be exacerbated and may spread widely. It may be wise in these cases to delay surgery until the healing of the osteitis is well advanced.

TUBERCULOSIS OF THE HIP JOINT IN CHILDREN

Fifteen patients with tuberculous arthritis of the hip joint which started during childhood were studied. Eight were seen from 1 to 10 months after the onset of symptoms and no foci of osteitis were present on the roentgenograms, a fact suggesting a synovial origin of the tuberculous process. Seven patients were seen from 1 to 50 years after the onset of symptoms. The hip joint in these patients was extensively destroyed on admission so that it was not possible to ascertain if the tuberculous arthritis had originated from a focus of osteitis or from a primary synovial tuberculosis. The ages of the patients at the time of onset of symptoms varied from 1 to 12 years, 5 years being the average.

Roentgenograms of the chest were taken on admission in all patients and at least every year while under our supervision. Five patients from 2 to 11 years of age had pulmonary lesions with the characteristics of a primary complex. This lesion was healed on admission in 3 patients and in the other 2 healing rapidly progressed. The chest plates of 7 patients never showed any tuberculous lesions while under our treatment, although in 2 of them there was some perihilar infiltration. Two patients developed new pulmonary tuberculous lesions 12 and 14 years after the onset of the hip lesion. One patient died of miliary tuberculosis 1½ years after onset of the hip tuberculosis. Two patients developed tuberculosis of the spine 14 and 50 years after the tuberculosis of the hip.

The onset of hip tuberculosis in children was usually insidious during the first few weeks or months. The patients often cried at night and had slight limp, but the hip was painless during the day time. Later on, the hip pain became acute and constant and there was fever, which went up as high as 104 degrees in some instances. The patients limped badly, weight bearing being sometimes impossible because of pain. The patients lost weight, the thigh became markedly atrophic, and contracture deformities of the hip developed in a few weeks or in a slow manner in several months. In 12 patients the leg was in marked flexion and adduction contracture on admission, and in 3 patients the thigh was in marked flexion, abduction, and outward rotation. There were only a few degrees of motion in the hip joint of most patients, due to pain and muscle spasm. The sedimentation rate was increased and the hemoglobin and red blood count were low. The elevated white blood count was invariably related to the development of an abscess and in some patients it reached as high as 16,000. The guinea pig inoculation with fluid obtained

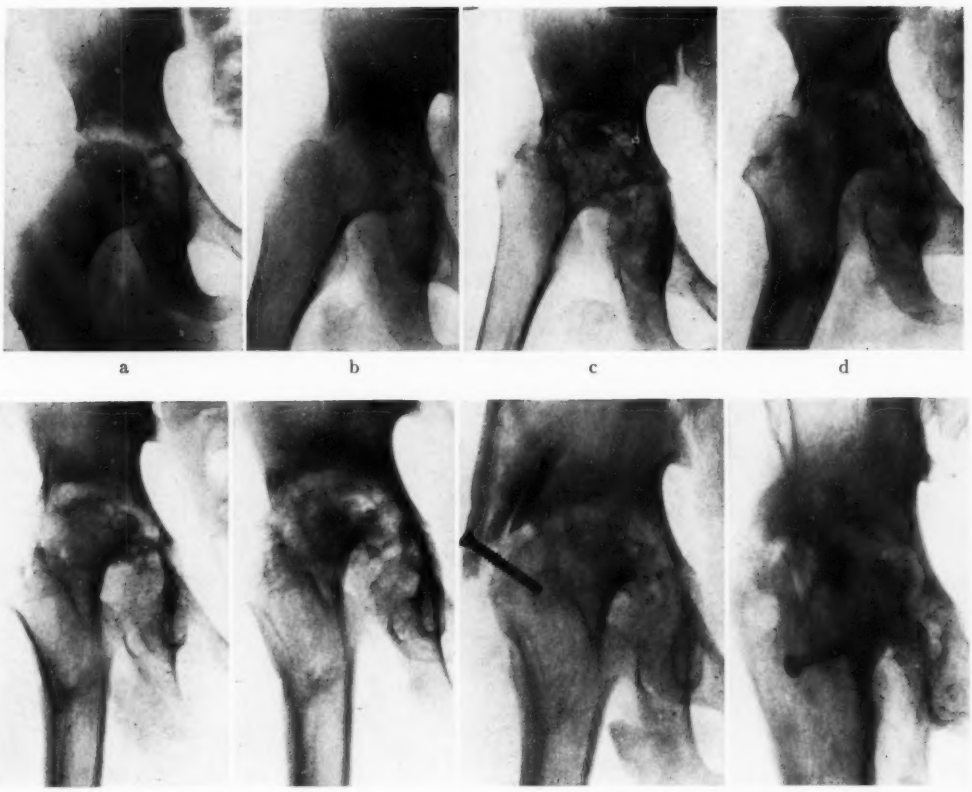

Fig. 7. a, Roentgenogram of the right hip of a 6 year old patient, taken in September, 1939. The subchondral bone of the femoral head and acetabulum appear destroyed. The joint space is wide. The patient started to limp 3 months before this picture was taken and had acute pain in the hip during the last 2 weeks. The leg was in flexion and adduction contracture. There was an abscess in the adductory region, which was aspirated. The acid-fast smear and the guinea pig inoculation were positive. Traction was applied on the right leg for 1 week, followed by plaster hip spica. b, Roentgenogram taken 9 months later. The joint space is very narrow and the shadow of an abscess is seen between the ischium and the femur. c, Roentgenogram taken 1 year and 8 months after onset of symptoms. It shows re-ossification of the femoral head and ilium. The joint space is still very narrow. The general condition of the patient was good. In May, 1941 a subtrochanteric osteotomy was performed (Farkas). d, Roentgenogram taken 3 months after osteotomy. The joint space has started to become wider. The femoral head shows a focus of bone destruction. There were a few degrees of painless motion in the hip. e, Roentgenogram taken 3 years after onset of symptoms shows very wide joint space and some activity of the tuberculous process in the femoral head. There was no pain or muscle spasm and range of motion in the hip was fairly good. The patient was then allowed to walk on crutches. f, Roentgenogram taken 1 year later shows advanced destruction of the femoral head. The joint space remains wide. The patient had some pain and recurrence of the adduction and flexion contractures. An extra-articular arthrodesis was performed 2 months later. g, Roentgenogram taken 3 months after the extra-articular arthrodesis. There is no longer bony contact between the tibial grafts and the trochanter. The joint space remains wide. Another extra-articular fusion had to be performed in April, 1944. h, Roentgenogram taken 1 year and 10 months after the second extra-articular fusion. Bony fusion has not yet become solid.

from the joint or from the abscess was positive in 10 patients, negative in 1, and it was not taken in 4 patients. In 5 patients Corper's media culture of the joint or abscess material was positive and in 3 patients the direct smear was positive. No attempts were made to differentiate between the human and bovine types of Bacillus tuberculosis.

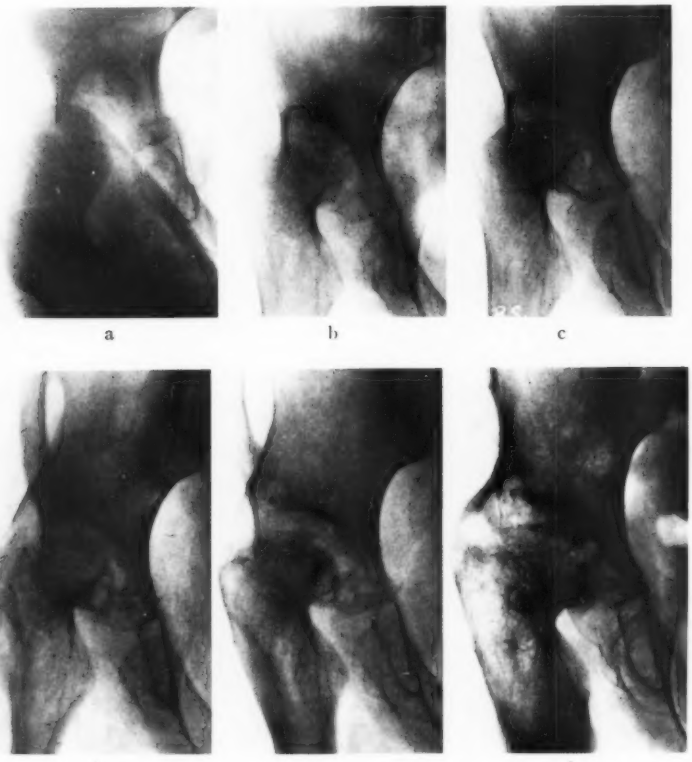

Fig. 8. a, Roentgenogram of the right hip of a 4 year old boy who had pain in this hip and limped for 9 months. The femoral head appears to be subluxated posteriorly. The acetabular roof is destroyed. The right leg was in extreme flexion and adduction contracture. Traction was applied on the right leg for 4 months, followed by plaster hip spica. A warm abscess appeared 6 months later on the posterolateral aspect of the hip region. The abscess was aspirated twice and a sinus opened and drained for 2 months. The acid-fast smear and guinea pig inoculation were positive for tuberculosis. b, Roentgenogram taken 1 year later shows the femoral head to be replaced in the acetabular cavity. The joint space is hazy and narrow. c, Roentgenogram taken 2 years and 3 months after onset of symptoms shows well advanced reossification of the iliac bone and upper femur. The contours of the femoral head and upper acetabulum are well delineated. The joint space is wide. There was some painless motion in the hip. An extra-articular arthrodesis was performed at that time. d, Roentgenogram taken 3 months after extra-articular fusion. Bone atrophy of the middle portion of the bone graft is already evident. e, Roentgenogram taken 9 months after the operation. The middle portion of the bone graft has been completely absorbed. The joint space is very wide. The femur appears adducted. A second extra-articular arthrodesis was then performed. The new bone graft also became reabsorbed in its middle portion, but a few months later new bone trabeculae bridged the defect. A subtrochanteric osteotomy had to be performed 1 year after the second arthrodesis operation in order to correct a progressive adduction contracture. f, Roentgenogram taken 1½ years after the second extra-articular arthrodesis. The middle portion of the bone graft which was applied at the time of the second operation is atrophic. The joint space is still visible. Clinically there was no motion nor pain at the hip joint.

The roentgenograms of children who were seen early in the evolution of the tuberculous process showed that the hip joint was rapidly destroyed in all the patients. The joint space became narrow a few months after the onset of symptoms. Shortly after, there was extensive destruction of the bone of the acetabular cavity and of the femoral head. There was generalized bone atrophy of the iliac bone and upper femur.

In several instances it was found the joint space became wider and the joint capsule ap

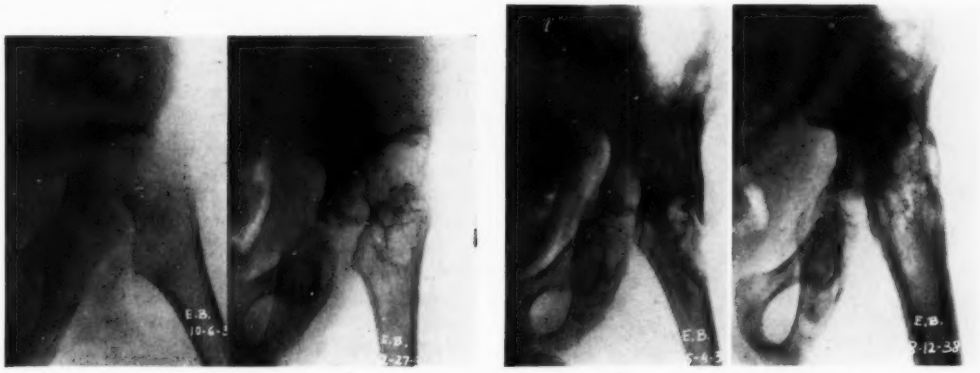

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Fig. 9. a, Roentgenogram of the left hip of a 2 year old boy taken 4 months after acute onset of pain in the hip and femur. The femoral head and acetabulum appear completely destroyed. The patient had refused to walk since onset of pain. On admission the left leg was in flexion, abduction, and outward rotation contracture, and any attempt to move the hip caused great pain. The left leg was placed in traction for 2 weeks and then in a plaster hip spica. An abscess developed in the lateral aspect of the thigh 1 year after onset of symptoms. This was aspirated once and the guinea pig test was positive for tuberculosis. b, Roentgenograms taken 2 years and 8 months after onset of symptoms. New, dense bone trabeculae are seen in the trochanteric region and in the femoral neck. A newly formed acetabular roof appears dense and well outlined. The joint space is wide. c, Represents a low power photomicrograph of a portion of the surface of the femoral head covered by a thick layer of fibrous tissue. This specimen was obtained during the hip fusion performed shortly after the stage represented by Figure 9b. The entire joint cartilage had disappeared during the active stage of the disease. No signs of tuberculous activity can be seen in the subchondral bone or in the fibrous tissue covering it. This fibrous tissue, which also covered the acetabular roof, was completely removed at the time of surgery, and the joint space was packed with bone grafts from the tibia and ilium. d, Roentgenogram taken 2 months after intra-articular and extra-articular arthrodesis. The hip is already solidly fused. The femur was placed in 20 degrees' abduction to compensate for the shortening of the left leg. e, Roentgenograms taken 2½ years after surgery. The hip is well fused and the tuberculous process is healed. The position of the femur in abduction had not changed.

c

peared distended during the first months of the disease, due to the collection of debris and caseous material inside the joint. The subchondral bone appeared irregularly destroyed and atrophic in these hips. It was not until a few months later that the joint capsule burst open and the intra-articular debris emptied into the soft tissues forming an abscess. The joint space then became narrow and it was possible for what was left of the bone of the femoral head to establish contact with the irregular acetabular roof (Figs. 7, 8, and 9).

In 12 children a tuberculous abscess was seen on admission, or it became ostensible while under treatment, from 3 months to 3 years after onset of symptoms; 14 months was the average period. In 4 patients the abscess could be seen on the roentgenograms but they could not be detected by clinical examination.

When the tuberculosis of the hip joint was very active the abscess was big, warm, difficult to visualize on the roentgenograms, and had a tendency to break through the aponeu-

Fig. 10. Roentgenogram of a 52 year old man who had tuberculosis of the hip since he was 2 years of age. There was slight springy motion at the hip joint and the thigh was in 50 degrees' adduction and 30 degrees' flexion. The patient had 5 flare-ups of the hip process during his life, each of several months' duration, with abscess and draining sinus formation. A subtrochanteric osteotomy was proposed to the patient but he refused surgery.

rosis and the skin. On the other hand, when the tuberculous lesions improved, the abscess became well delimited and cast on the roentgenograms an opalescent shadow, sometimes quite dense (6). In 8 patients the abscess became absorbed and disappeared in 2 to 5 years; it was necessary to aspirate the abscess several times in 3 of these patients.

Four patients seen by us from 1 to 50 years after onset of symptoms developed draining sinuses which persisted for several years. The probable causes for the persistence of the draining sinuses were as follows: Intra-articular sequestra were seen on the roentgenograms of 2 patients whose hips were secondarily infected. The drainage ceased in one of these patients after extrusion of the sequestra and spontaneous ankylosis of the hip joint, whereas draining sinuses reopened for 5 years off and on in the other patient who still has motion in the hip joint. A 9 year old patient was seen in this clinic 4 years after onset of his symptoms, with a draining sinus over the iliac crest of 2 years' duration. The roentgenograms showed extensive destruction of the hip joint and bone sclerosis over the iliac wing along the sinus tract. Extensive immobilization and repeated sinus resections failed to control the drainage which was due to secondary infection. The hip joint became ankylosed 6 years after admission, but the drainage persisted. The patient died of generalized amyloidosis 15 years after onset of the hip disease. Another patient was a 52 year old male who had had tuberculosis of the hip joint ever since the age of 2 years and had had a draining sinus during short periods of his life. The thigh was in a position of 50 degrees' adduction and the hip joint, which was completely destroyed, never became ankylosed because of the faulty position of the leg into adduction. The tuberculous process became reactivated periodically (Fig. 10).

In all the patients seen during the first 2 years of the disease the faulty position of the hip was easily overcome in a few weeks of traction, and then plaster cast immobilization controlled the pain and gave comfort to the patient. The general condition of the patients improved slowly. In only 1 patient was a recrudescence of the lesion observed, which occurred 1 year after the onset of treatment. The roentgenograms taken during the second year of the hip disease showed reossification of the atrophic bone. Portions of the femoral head and acetabulum, which appeared as if

Fig. 11. Roentgenogram of the left hip of a 24 year old woman who had tuberculosis of the hip at 10 years of age. The patient received no treatment. The hip had been asymptomatic for 12 years when we first saw her, and remained so during the 13 years of follow-up in this clinic. The patient was treated for tuberculosis of the spine and lungs, and the hip remained symptomless and freely movable.

they had been destroyed during the acute stage, also became reossified. This reossification was usually irregular and a few dense new bone trabeculae were seen crossing the atrophic area. The bone contours became well demarcated and the shadow cast by the tuberculous abscess became denser, evidently due to deposition of calcium salts in the caseated debris (Figs. 7, 8, and 9). Clinically, there was simultaneous improvement of local and general symptoms. The joint motion, although limited, was painless and no pain or muscle spasm was produced when the leg was gently shaken by the foot. There was no fever and the sedimentation rate, red blood count, and hemoglobin approached normal readings. The tuberculous abscess, if present, became smaller. The white blood count remained somewhat elevated until the tuberculous abscess disappeared completely. This clinical improvement together with the reossification of the atrophic and partially destroyed bone occurred in 8 patients from 1½ to 2½ years after onset of symptoms. In 2 patients it occurred 3 years and in 1 patient 4 years after onset. One patient died of miliary tuberculosis and another had a secondary hip infection and died of amyloidosis. Two patients came to us years after the onset of disease and it was not possible to ascertain when this "healing reaction" had appeared.

During this stage of reossification the joint space remained narrow, but in the roentgenograms taken a few months later it was seen in 8 patients that the joint space was becoming wider (Figs. 7 and 8). This widening of the joint space was remarkable in 2 patients who were allowed early hip motion. It was also seen in patients who were immobilized in plaster cast and remained in bed for long periods. Lorenz advised the practice of very early weight bearing and ambulatory treatment to his patients immobilized in plaster cast, in order to bring the bone of the femoral head and the acetabulum into close contact, thus favoring early joint ankylosis. This practice has not been followed by many orthopedists because early weight bearing may often reactivate the hip tuberculosis.

Material for histologic study was obtained from all the patients operated upon, but in only 4 patients who had an intra-articular and extra-articular fusion were we able to study the hip joint well. Three of these patients were operated upon 2 to 4 years after onset of symptoms and 1 patient was operated upon 14 years after. The synovia and joint capsule were fibrotic, thickened, and adherent to each other. In the midst of the scar tissue, small encapsulated foci were seen with necrotic cells and a few epithelioid cells. Foam cells containing lipoid substance were also seen in 2 instances. Extensive portions of the joint cartilage had been destroyed and the remaining cartilage was invaded by nonspecific granulation tissue. There was fibrosis of the marrow, which contained only a few tubercles well surrounded by connective tissue. Small areas of caseous necrosis were being substituted by young connective tissue. Active new bone formation was widespread. The joint space was wide in 2 patients due to thick and poorly vascular fibrous tissue and fibrocartilage which covered the femoral head and acetabulum (Fig. 9c). This fibrocartilage

Fig. 12. Roentgenogram of the left hip of a 62 year old woman taken 3 months after an intra-articular and extra-articular arthrodesis plus subtrochanteric osteotomy. The hip was solidly ankylosed. Notice that after the osteotomy the upper femoral fragment went into abduction, due to the action of the gluteus medius, thus determining pressure stresses over the extra-articular bone graft and over the denuded hip joint area. This stimulated new bone formation and resulted in fusion.

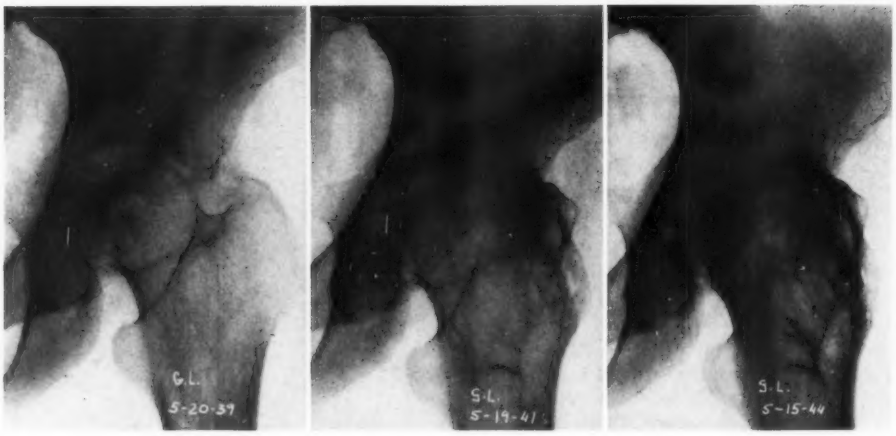

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Fig. 13. a, Roentgenogram of a 25 year old woman who had pain in the left hip off and on for 5 years. The joint space is very narrow and there has been minimal destruction of the femoral head and acetabulum. The patient has healed pulmonary tuberculosis. b, Roentgenogram taken 2 years after extra-articular fusion. The patient started walking 1 year after the operation and had no pain nor motion in the hip. c, Roentgenogram taken 5 years after fusion. The hip is solidly ankylosed.

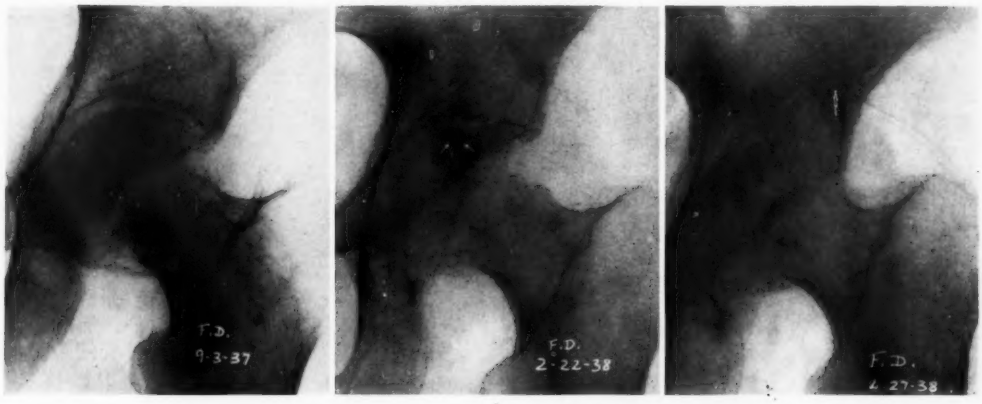
was being slowly invaded by marrow tongues and new bone trabeculae.

The end-results in the 15 patients with tuberculosis of the hip which started in childhood were as follows:

1. No arthrodesing operations were performed in 6 patients: The hip joint of 1 patient, who had never been treated, was stable, painless, and had good range of motion (Fig. 11). In another patient treated by prolonged immobilization in plaster cast the result was a freely movable but unstable hip. In 2 patients treated by plaster cast immobilization, the hip became ankylosed 5 and 14 years after onset of symptoms. A 52 year old male had tuberculosis of the hip for 50 years with several flare-ups and draining sinuses off and on. The leg was in 50 degrees' adduction and there was slight springy motion at the hip, which never became ankylosed in spite of prolonged immobilization (Fig. 10). A subtrochanteric osteotomy and adductor tenotomy were advised but the patient refused surgery. One patient died of amyloidosis after 11 years of continuous drainage from the hip which did not respond to treatment.

2. Four patients from 6 to 10 years of age were treated by immobilization in hip spica cast followed by extra-articular arthrodesis of the hip joint. Two patients were operated upon 2½ years after onset of the disease, and their hip joint became solidly ankylosed in 2 years. The 2 other patients were operated upon 4 years after onset, when the roentgenograms showed a wide clear space between the femoral head and the acetabular cavity. The hip joint failed to become ankylosed in both patients, and the roentgenograms taken a few months after surgery showed absorption and fracture of the bone graft. A second extra-articular operation was performed on the same patients 10 months later. Solid ankylosis was not obtained until 3 and 4 years after the second operation. The fibrous tissue filling the wide joint space at the time of surgery was, no doubt, responsible for delaying the growth of bone trabeculae across the hip joint (Figs. 7 and 8).

3. Four patients were treated by immobilization in hip spica cast followed by intra-articular and extra-articular arthrodesis of the hip joint. Three patients were from 5 to 9 years of age at time of surgery, which was performed 2 to 4 years after the onset of the disease. A 26 year old female was operated upon when she came to our service because



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d

Fig. 14. a, Roentgenogram of a 31 year old woman who had pain and limitation of motion in the left hip for 6 months. Generalized bone atrophy and narrowing of the joint space can be seen. The patient had pulmonary tuberculosis for 10 years. b, Roentgenogram taken 5 months later shows extreme bone atrophy of upper femur and acetabulum, and great narrowing of the joint space. A wedge-shaped sequestrum can be seen in the upper margin of the femoral head (arrows). There was an extensive abscess around the hip joint. c, Roentgenogram taken 2 months later shows no joint space. It looks as if this had melted away. The wedge-shaped sequestrum appears somewhat fragmented. The patient died shortly after of pulmonary tuberculosis and tuberculous pericarditis. d, Represents a low power photomicrograph of a section through the wedge-shaped sequestrum of the femoral head. There is extensive necrosis of all the marrow elements. The joint cartilage had been completely destroyed.

of a painful tuberculous hip she had had since 12 years of age. The hips of these 4 patients operated upon became solidly ankylosed from 2 to 6 months after operation, 4 months being the average. There were no operative or postoperative complications. The hips were not dislocated at the time of operation and only the fibrous tissue and fibrocartilage that could be curetted out from the periphery of the joint was removed. The denuded portion of the joint space was packed with cancellous bone and extra-articular grafts were applied. Care was taken not to damage the vessels of the capsule (Fig. 9).

A 5 year old patient came to the clinic 6 months after onset of a tuberculosis of the hip. Two months later an incision was made over the lateral aspect of the upper thigh with the idea of doing a subtrochanteric osteotomy, as advised by Farkas in 1939. However, the osteotomy was not performed because a widespread, deep abscess was encountered. This abscess became secondarily infected and the patient died of miliary tuberculosis 6 months after surgery.

From this study of 15 proved cases of tuberculosis of the hip in children, the following observations have been made:

1. The treatment of tuberculosis of the hip must aim at fusion because only in rare exceptions is a stable, painless and movable hip joint obtained.

2. Surgery must be delayed until the general condition of the patient is satisfactory and

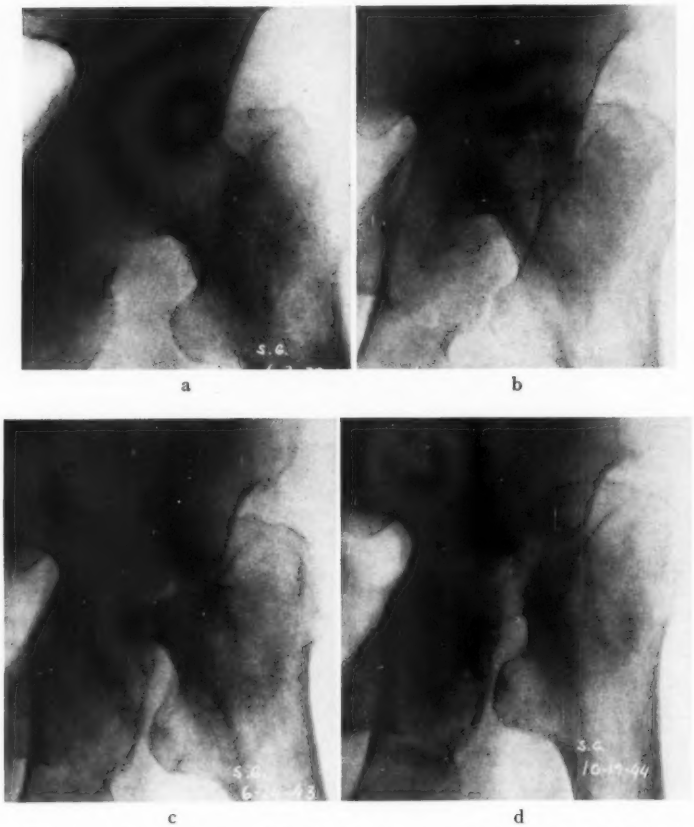

Fig. 15. a, Roentgenogram of the left hip of a 50 year old man who had had pain in the hip for 10 months. There is advanced destruction of the femoral head and destruction of the acetabulum, but no bone atrophy. Pus was aspirated from the hip joint. The smear, culture and guinea pig inoculation were positive for tuberculosis. The lungs were negative. The hip was immobilized in hip spica for 3 years. b, Roentgenogram taken 2 years later, showing more destruction of the femoral head. The patient had a very big abscess in the left thigh which was aspirated many times. There was fairly good range of motion in this hip which was only slightly painful. c, Roentgenogram taken 3 years later shows absence of the femoral head. The tuberculous abscess had disappeared and the general condition of the patient was excellent. d, Roentgenogram taken 7 years after onset of symptoms. The femoral head and neck had been completely destroyed. The left hip was freely movable but unstable. The patient had no pain.

the roentgenograms show a sound reossification of the atrophic and of some of the previously destroyed bone. This "healing reaction" appears usually from 1½ to 3 years after onset of hip symptoms, if a good general and local treatment is followed.

3. A warm, widespread abscess is a contraindication for surgery. A cold, well localized abscess is not a contraindication. Lung tuberculosis was never a contraindication to surgery in children because the process healed long before the "healing reaction" occurred in the osteoarticular tuberculous lesion.

4. Extensive immobilization of the leg in hip spica casts should not be looked upon as an innocuous treatment and should not be pro-

longed any longer than necessary. Great atrophy, shortening of the extremity, and possible permanent damage to the epiphyseal plates about the knee and stiffening of the knee joint are frequent sequelae of prolonged immobilization (7).

5. As a rule, the optimum time for surgery is during the third year of the disease. If surgery is delayed beyond the third year the joint space may increase in width due to overgrowth of fibrous tissue and fibrocartilage which substitutes the destroyed joint cartilage.

6. Extra-articular fusion will bring about prompt hip ankylosis only if there is contact between the bone of the femoral head and the bone of the acetabulum at the time of surgery.

7. Extra-articular hip fusion alone will fail, or the ankylosis will be greatly delayed if there is abundant soft tissue in between the femoral head and the acetabulum at the time of surgery. It takes years for new bone trabeculae to penetrate into the avascular fibrocartilaginous tissue and cross the joint space in order to establish solid bony fusion. As much of the interposed fibrous tissue as possible will have to be removed at the time of surgery and the joint packed with bone chips if an arthrodesis is desired in a short time (3, 9).

8. A tuberculous hip joint is not completely immobilized even with a well fitted and extensive plaster cast. The potent adductor muscles tend to pull the thigh constantly into adduction (4). A bone graft applied over the outer aspect of a tuberculous hip joint will be submitted to distracting forces which will bring about atrophy of the graft and even its fracture. An extra-articular bone graft over a tuberculous hip joint is usually incapable of stabilizing the hip if there is abundant soft tissue interposed between the femur and acetabulum (Fig. 8). A tuberculous hip is not safe until bone trabeculae cross the joint space.

In order to abolish the action of the adductors on the hip joint, we have been performing a subtrochanteric osteotomy at the time of the arthrodesing operation of the hip. After the osteotomy the upper femoral fragment is under the almost exclusive action of the abductors. The denuded femoral head and acetabulum and the bone graft placed in the outer aspect of the joint are then submitted to pressure stresses, which stimulate new bone formation resulting in bony fusion (Fig. 12). Several weeks elapse before the osteotomy site becomes solid allowing the adductors to act anew over the hip joint area, but by then bony bridges have already started to form at the hip and the fusion proceeds unhampered. This procedure of combining the subtrochanteric osteotomy with the hip fusion has been used successfully by us in the arthrodesis of painful degenerative osteoarthritic hips, and invariably the fusion time has been greatly shortened. Intertrochanteric osteotomy may be used in these cases to eliminate the action of the psoas over the upper fragment, but in tuberculosis a subtrochanteric osteotomy is safer. Metal fixation is unnecessary and in many instances it is harmful to the process of osteogenesis. It must never be employed in tuberculous lesions.

TUBERCULOSIS OF THE HIP JOINT IN ADULTS

Nine patients from 23 to 61 years of age, with proved tuberculosis of the hip, were seen. There were 6 males and 3 females. Their hip tuberculosis started from 1 to 3 years prior to admission. Both hips were involved in 1 patient. In no instance was a para-articular focus of osteitis seen in adults prior to the hip joint invasion

The evolution of tuberculosis of the hip in adults varied more widely than in children and in many patients it was closely related to the evolution of their pulmonary tuberculosis. We found it convenient to classify the adult patients with bone tuberculosis into three groups.

Group A. Patients with cured or with minimal pulmonary tuberculosis who developed osteoarticular tuberculosis of the hip of very slow onset with mild hip pain of intermittent character, slight limp, and slowly increasing stiffness of the hip joint. These patients had no tuberculous abscess formation, but if one developed, it was always small and noninfiltrative. The roentgenograms showed slow progressive thinning of the joint space and moderate destruction of the subchondral bone of the femoral head and acetabulum. The destructive hip process usually became arrested in 2 to 3 years.

There are in the files of this hospital 11 patients who very likely belonged to this group. In only 2 patients was it possible to prove by guinea pig inoculation the tuberculous nature of the lesion, and only these 2 patients were included in our series. One was a 23 year old woman with a healed pulmonary tuberculosis who came to our clinic 3 years after onset of the hip symptoms. There was no tuberculous abscess and the roentgenogram showed an arrested hip lesion with very narrow joint space and minimal bone destruction (Fig. 13). The other patient was a 54 year old man with a fibrotic tuberculous lesion in the right apex of minimal extent. He was admitted to our service 10 months after onset of hip symptoms. A small, cold abscess in Scarpa's triangle was found, and the roentgenograms showed marked bone atrophy about the left hip and areas of subchondral bone destruction. An extra-articular hip arthrodesis was performed shortly after admission in the first patient and one year after conservative treatment in the second patient. Both hip joints were solidly ankylosed 1 year after surgery.

Group B. Patients with active pulmonary tuberculosis who developed tuberculosis of the hip. Four of our patients belonged to this group, 2 males and 2 females of from 27 to 31 years of age. All these patients had more or less acute onset of sharp pain in the hip with marked limitation of motion. They soon developed large, warm tuberculous abscesses. The roentgenograms showed rapid narrowing of the joint space, extreme bone atrophy, and in 2 patients one or two wedge-shaped subchondral sequestra were seen (5). The roentgenograms taken in the consecutive months showed that the hip joint seemed to melt away in 3 patients, while the other showed bone sclerosis 1 year after onset. All 4 patients died from 1 to 6 years after onset of hip tuberculosis with extensive lung cavities (Fig. 14).

At autopsy the hip joint was examined in 1 of these patients. Caseous material filled the cavity. The articular cartilage was absent, the synovia and joint capsule showed a great number of foci of caseous necrosis with minimal tubercle formations. There were areas of caseation necrosis in the bone marrow in the head of the femur and acetabulum. The wedge-shaped sequestra proved to be formed by dead bone with primary caseous necrosis of all the marrow elements.

The orthopedic treatment for the patients of this group consisted only of immobilization of the leg with traction or hip spica.

Group C. Patients with very destructive osteoarticular tuberculosis, with big abscess collections and no, or minimal, pulmonary tuberculosis with surprisingly good general condition. Three patients, all males, from 37 to 63 years of age belonged to this group, one with bilateral hip tuberculosis and tuberculosis of the knee. These patients had no, or very low, fever. The red blood count was almost normal, however, the sedimentation rate and the white blood count were elevated. The pain was moderate in character or sharp, aggravated by weight bearing. Large tuberculous abscesses collected in the middle, lateral, or posterior aspect of the hip joint. Roentgenograms showed extensive destruction of the femoral head and not so much of the acetabulum. The bone destruction progressed for several years before the process became arrested. Two patients were treated conservatively and have been followed for 5 and 9 years. One is well and there are a few degrees of painless motion in the hip joint; the roentgenograms showed the femoral head reduced to one-third of its size. The process has been arrested now for 2 years and an arthrodesis operation has been advised but it has been refused by the patient. The other patient had the left femoral head completely destroyed before the tuberculosis became arrested 3 years ago (Fig. 15). He now has fairly good range of motion in this hip which is unstable. The other hip and one knee became involved 1 and 2 years after the onset of the symptoms in the left hip. His general condition has been good for the past 5 years. A 63 year old man was treated surgically by extra-articular fusion. An abscess was encountered around the hip joint which became infected and drained profusely until the patient died of cerebral thrombosis 3 months after surgery.

The treatment of tuberculosis of the hip in adults must vary according to the stage of the tuberculous process in each special case. The patients with hip lesions described for group

A may be treated by extra-articular hip fusion as soon as the general and local tuberculous processes are under control, usually from 2 to 3 years after the onset of the hip symptoms. Intra-articular fusion in these involved hips is not absolutely necessary because the joint space is very narrow and is easily breached by bone trabeculae after the extra-articular graft has become solid. The patients with tuberculous lesions as described in group B must be carefully studied before deciding upon any surgical procedure on the hip, because the hip tuberculosis is but a symptom of a spreading tuberculous process with no tendency to become arrested, and surgery in these patients is definitely contraindicated. The patients of group C are better treated conservatively at first, and surgery must be delayed until the destructive process becomes arrested. Resection of the upper femoral epiphysis may in the selected cases shorten the healing time. A hip fusion may be technically impossible to perform in many patients of this group when the process is arrested because of the extensive loss of bone substance. A Trumble or a Brittain operation may be the answer but we have had no experience with these procedures.

SUMMARY

The evolution and the results of conservative and operative treatments were studied in 31 proved cases of tuberculosis of the hip followed for a minimal period of 4 years.

The patients were divided into 3 groups: The first group comprises 7 patients, all children, who had a para-articular focus of tuberculous osteitis. The roentgenographic and histological characteristics of the two different types of tuberculous osteitis were described. In the granulous osteitis the roentgenograms show a small area of uniform bone destruction, whereas one or several small bone sequestra are seen in the area of destruction due to caseous osteitis. Both types of tuberculous osteitis have a tendency to heal under prolonged conservative treatment. However, the hip joint in each of the 7 patients was invaded sooner or later by the tuberculous process.

The hip joint was very slowly destroyed when lesions of tuberculous granulation tissue with no caseation predominated. On the other hand, the involved hips were destroyed rapidly when lesions of caseation necrosis were widespread in the joint structures. The clinical symptoms in the last group of patients were of acute character, whereas in the first group they were mild and chronic. Once the hip joint became involved, it either fused spontaneously or a fusion operation had to be performed because of persistent pain and deformity. A Brittain operation performed in 1 patient 5 years after the onset of symptoms failed due to erosion of the graft by a tuberculous abscess.

It is proposed that the treatment of tuberculous osteitis close to the hip joint be directed toward obtaining an ankylosed joint as soon as the local process is quiescent and the general condition of the patient is favorable. No time should be wasted trying to heal the osteitic process by prolonged immobilization, because the hip joint becomes sooner or later involved in the great majority of patients.

The second group comprises 15 patients with tuberculous arthritis of the hip joint with onset during childhood. In 8 patients seen early after the onset of symptoms the tuberculous arthritis was probably of synovial origin. The symptoms and evolution of the tuberculosis of the hip in children were discussed both from the clinical and roentgenologic points of view. It was concluded that the treatment must aim at fusion, because only in rare instances is a stable, painless, and movable joint obtained. Surgery must be delayed until the general condition of the patient is good and the roentgenograms show a sound reossification of the atrophic bone. This "healing" reaction appeared usually from 1½ to 3 years after onset of hip symptoms if good general and local therapeutic measures were followed. The optimum time for surgery is, thus, during the third year of the disease. If surgery is delayed beyond the third year the joint space may increase in width due to overgrowth of fibrous tissue. This overgrowth has to be removed at the time of surgery. The best results of hip fusion were obtained with the intra-articular and extra-articular methods combined. The author recommends a subtrochanteric osteotomy at the time of sur-

gery in order to abolish, for a time, the action of the adductors on the upper portion of the femur, which submits the bone graft to distracting forces and thus to atrophy.

The third group comprises 9 patients of adult age with hip tuberculosis. Its evolution varied widely and in many patients it was closely related to the evolution of their pulmonary tuberculosis. Some patients had only minimal bone destruction with thinning of the joint space. Their general condition was good and responded well to an extra-articular arthrodesis. Other patients, who had active pulmonary tuberculosis, exhibited very extensive and fast destruction of the hip joint, and died a few years after the onset of the hip involvement. Other patients had very destructive osteoarticular tuberculosis, with abscesses, but with good general condition. The process lasted for a long time and when arrested the hip was very unstable.

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PORTACAVAL ANASTOMOSIS

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THE portacaval shunt as an efficient means of ameliorating portal hypertension opens up a broad field of usefulness. It was heartening in our early cases to find that patients tolerated the operation amazingly well, also that despite the fact that a number were bad risk patients only 5 in a series of 40 patients in whom portacaval shunts were completed failed to recover from the operation.

Although the portacaval shunt operation has been employed by us primarily to eliminate the threat of lethal hemorrhage in cases of portal hypertension, we have found that the concomitant relief of ascites when present has been effected.

A discussion of some of the causes of portal hypertension in terms of indications for the portacaval shunt follows.

Schistosomiasis. We consider the portacaval shunt operation as the one great hope in cases of schistosomiasis of the liver. This is a disease that, in some part of the world, accounts for a good percentage of hospital admissions. From the natural history and pathology of the disease, it is now well known that the patient dies from complications of portal hypertension rather than from damage to liver cells. From the point of view of liver function the cases are excellent operative risks. Portacaval shunt should protect them against lethal hemorrhage and assure the relief of ascites, which, in this disease is primarily the result of portal hypertension. We can report one case with an excellent postoperative result.

Chiari syndrome. Our experience with Chiari syndrome (thrombosis of the hepatic veins) is limited to one case. The outstanding findings in this case was the presence of a very large liver, a spleen several times larger than normal, ascites, and a moderately elevated portal pressure upon measurement. Edema of the legs and a tendency to recurring pleural effusions was an additional unexplained finding in this case. The liver biopsy revealed extreme congestion with apparent widespread liver cell damage but, strangely enough, aside from a slight depression of serum albumin, the liver function tests were but slightly if any deranged. A marked immediate improvement in the ascites followed the establishment of a splenorenal shunt in this case but, the persistence of some ascites marked leg edema and pleural fluid in the right chest constituted a problem. Finally, with the institution of sodium lactate therapy, there was a marked response from diuresis and after the lapse of three weeks the edema had completely disappeared (1). Now 1½ years since operation, aside from a tendency to anemia, the patient's general condition has markedly improved. Her liver function studies are normal and the organ has returned to almost normal size. For the past 9 months she has worked as a secretary to the United Nations and states that by comparison her health is now robust.

Chiari syndrome is reputedly a serious condition from which patients do not recover. This patient, after a 1½ year follow-up, is apparently recovering.

Banti's syndrome. A common cause of portal hypertension in this country is Banti's syndrome. Patients so afflicted and showing esophageal varices or presenting a history of gastrointestinal bleeding are unequivocally candidates for the portacaval shunt. Those patients with Banti's syndrome who have essentially normal liver chemistry are unusually good operative risks for the portacaval shunt operation; those having cirrhosis require special handling.

Cirrhosis of the liver and portal hypertension. It has long been recognized that portal hypertension of varying degrees develops some time during the course of the disease in the common types of cirrhosis of the liver. The association of portal hypertension with the occurrence of

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hemorrhage and ascites in cirrhosis has likewise been long accepted as fact.

Whereas the fact remains that portal hypertension is the common basic cause of severe gastrointestinal hemorrhage in cirrhotics, more recently prothrombin derangement, as it affects blood clotting, has been accepted as a cofactor in inciting or prolonging hemorrhage under certain conditions. Similarly, the relationship of the blood proteins, particularly the albumin content, as a factor in ascites is better understood.

Prothrombin derangement (deficiency) may be the result of two causes: (1) failure to absorb vitamin K; (2) inability of the liver to make adequate amounts of prothrombin. The former occurs in conditions effecting biliary obstruction in which the triad of jaundice, acholic stools, and a high alkaline phosphatase are familiar. The latter occurs in serious decompensation of the liver.

Since progress has been made in recent years in the medical treatment particularly of Laennec's (portal) cirrhosis, it is pertinent to discuss its possible influence on the problem of hemorrhage.

Dr. Arthur Patek (2) tells me that in his series of 124 treated patients the incidence of hematemesis was 33 per cent (42 cases). This compared with an incidence of 27.4 per cent reported by the same author (3) for a series of 386 untreated patients with cirrhosis indicates that the modern regimen has not reduced the incidence of hematemesis. Though one could not expect to affect favorably the portal hypertensive component in hemorrhage by a medical regimen, it was hoped that improvement in the prothrombin component (as has certainly been demonstrated in many cases) would remove what would prove to be an important inciting factor and thus reflect a lowered incidence of hematemesis.

The above comparative statistics, when coupled with the finding that ruptured esophageal varix was recorded as the cause of death in 100 patients (26 per cent) of 386 cases of cirrhosis (3), may be interpreted to indicate that portal hypertension rather than the prothrombin derangement component is the important factor in the cause of lethal hematemesis.

Whereas the incidence of hematemesis has not apparently been reduced following the introduction of the modern medical regimen for the treatment of Laennec's cirrhosis, the likelihood of a patient surviving an individual attack of hematemesis has improved. Credit for this may, in large part, be due to more ready availability of transfusions through the development of blood banks. However, we again refer to the results in Dr. Patek's series of treated patients, where we note, under optimum treatment conditions, that 22 of the 44 patients having hematemesis died. One half of the patients died within 1 year of the onset of their first hemorrhage.

A realistic appreciation of the figures given makes it imperative that those of us responsible for the care of patients with cirrhosis recognize our obligation to protect the patient from lethal hemorrhage.

Fortunately, we now have adequate evidence that a portacaval anastomosis, either of the splenorenal or the portal vein to vena cava type, will protect patients against the recurrence of severe gastrointestinal hemorrhage. The efficiency of the anastomosis in lowering the portal blood pressure, thus preventing the occurrence of hemorrhage, has been recorded and observed by us in patients again and again. The portacaval shunt operation has been accomplished by us forty times with an operative mortality of 12½ per cent. In view of these facts, we consider the procedure no longer an experimental operation but commend its consideration in cases of cirrhosis when patients have had one or more episodes of gastrointestinal hemorrhage—patients who when treated medically under the best of circumstances have only a 50 per cent chance of living.

Ascites. Although ascites regularly disappeared following the portacaval shunt operation when done in cirrhosis cases for the control of hemorrhage, we do not consider ascites as a primary indication for the operation.

The outstanding achievement of the modern liver regimen in the treatment of Laennec's cirrhosis of the liver has been the relief of ascites. The relief of ascites occurs *pari passu* with improvement of liver function particularly in respect to a rise in the blood albumin.

Failure to clear ascites following a vigorous and prolonged treatment regimen is usually due either to failure to regain liver compensation in the presence of a too severely damaged liver or to the presence of excessive portal hypertension. The latter cause may be strongly suspected in patients whose blood albumin level is in excess of 3 per cent and essentially confirmed if roentgenograms demonstrate the presence of esophageal varices. We recommend portacaval shunt in this latter group of treatment failures for the following reasons: (1) The demonstration of esophageal varices in such cases is proof of the existence of a severe grade of portal hypertension which in itself constitutes a serious threat of sudden death from hemorrhage. (2) If this group of medical treatment failures are allowed to go on indefinitely with repeated paracenteses, they eventually die of "wasting ascites." (3) They are over all good operative risks. The liver is usually excellently compensated. The organ may be capable of maintaining an albumin blood level well in excess of 3 per cent were there not too much albumin loss through the removal of excessive amounts of ascitic fluid. Such patients are among our most grateful ones.

We hope in the near future to assemble our data in cirrhosis cases so that we may compare the albumin blood level with ascites in the presence of different degrees of portal hypertension as measured at the operating table before and after the establishment of portacaval shunts. The frequently observed fact that ascites will appear in the average cirrhotic when the blood albumin approaches 3 per cent, whereas tissue edema does not appear until a considerably lower level is reached, may be taken as prima facie evidence that a portal hypertensive component is involved to the formation of ascites.

Posthepatitis cirrhosis. Posthepatitis cirrhosis is a disease seen all too frequently these days. When the disease has reached the stage of causing demonstrable varices, with or without a history of bleeding, if the liver function is yet reasonably good, we recommend the establishment of a portacaval shunt. We have gathered the impression that when the disease has reached this stage the modern liver regimen affects little if any its downhill course and there is extreme likelihood of seriously persistent bleeding.

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THE PHYSIOLOGY OF FECAL CONTINENCE

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STUDIES of the distal colon and anal sphincters in animals, as reported by several investigators, have been fairly uniform in showing a functional relationship of one to the other. Similar studies in man, while less numerous, have been mainly concerned with changes resulting from various nerve lesions. The purpose of this communication is to report the results of a study of the mechanism of fecal continence in normal adults. This mechanism is of particular importance to surgeons who, within recent years, have taken a renewed interest in sphincter preservation in resections of the rectum for cancer.

DEFINITION OF FECAL CONTINENCE

Fecal continence, the ability to retain feces until its delivery is convenient, is of two types: colonic and sphincteric. Colonic continence depends on the plastic adaptation of the smooth muscle of the colon to the enlarging fecal mass. Its usefulness in the normal adult is evident in the practically constant finding, by x-ray and sigmoidoscopy, of fecal material collected in the sigmoid above an empty rectum, without the aid of an anatomically demonstrable sphincter at the rectosigmoid junction. It is this type of continence which is retained by the patient with well managed abdominal colostomy and its full utilization makes colostomy a bearable deformity. It is entirely under the control of the autonomic nervous system and may be responsible for some of the functional results reported by those who favor sphincter preservation.

Sphincteric continence implies the retention of bowel contents by sphincteric contraction when the plastic adaptation of the colon reaches an end and peristalsis begins. That sphincteric continence is not a simple purse-string effect but a complicated and highly integrated mechanism will be shown in the studies presented here.

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THE SPHINCTERIC APPARATUS

While it is not the purpose of this communication to deal extensively with the anatomy of the sphincteric apparatus, several points which bear on the experimental findings to be reported should be clarified. The internal sphincter, a collection of smooth muscle fibers surrounding upper portion of the anal canal, is a continuation of the circular muscle of the distal part of the rectum. It is entirely under the control of the autonomic nervous system.

The external anal sphincter is composed of striated muscle under the control of the voluntary nervous system. It is variously described as consisting of two (9, 11, 15, 29, 35) or three (32) separate muscle bundles. With the anal canal closed, the superficial portion of the external sphincter lies distal to the internal sphincter, while the deeper portion partially overlaps it. With the anal canal dilated by the presence of a fecal mass or, as in the experiments to be described, by the presence of an obturator, the two sphincters come to occupy a more truly internal and external position (11), although some overlap remains. These facts make it possible to secure graphs representing the function of each sphincter separately, but only to a relative degree. A graph representing the function of one sphincter will necessarily have some components of the other superimposed on it. Sufficiently clear tracings can be obtained, however, to indicate the function of each.

The external sphincter is made up of striated muscle which differs from that in other parts of the body in its reaction to denervation. Goltz and Ewald found that it remained reactive to electrical stimulation for long periods after the removal of the lumbar and sacral portions of the spinal cord in dogs. In animals

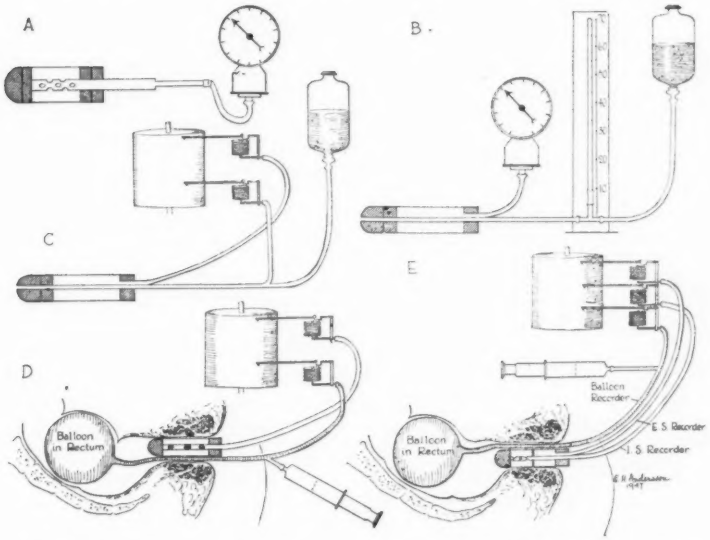

Fig. 1. Methods used for studying the mechanism of fecal continence. A, (method I) a simple manometric apparatus for recording the strength of voluntary sphincter contractions. B, (method II) for obtaining simultaneous readings of colonic and sphincteric activity (colo-sphincto-metrogram), later adapted to kymographic recording as in C, (method III). D, (method IV) for recording the effects of rectal stimulation on the anal sphincters. E, (method V) similar to D except that the activity of the internal and external sphincters are recorded independently and simultaneously.

poisoned with curare, von Frankl-Hochwart and Froelich found the external sphincter to react to stimulation long after other skeletal muscles had ceased to react, findings which have been only partially substantiated by the more recent work of Learmonth and Markowitz (27). Arloing and Chantre showed that there were no microscopic changes in the external sphincter 11 months after destruction of its nerve supply. Because of these findings the external sphincter "has been conceived to possess nerve centers similar to those of the mysenteric plexus of Auerbach" (24), a point that has been recently confirmed microscopically by Reuther.

The part played by the levator ani muscles in the maintenance of sphincteric continence is difficult to evaluate. They have been described both as dilators of the anal canal and as having a sphincteric function (32, 34). Since these muscles have fibers running both radially and parallel to the anal canal, it is probable both views are at least partially correct.

METHODS OF STUDY AND RESULTS

Method I

The first method of study consisted of a simple apparatus for measuring the strength of the voluntary contraction of the external anal sphincter. A cylinder of light rubber was fastened between the ends of an obturator 1 inch in diameter. The obturator was connected by heavy, small-bore, rubber tubing to a blood pressure aneroid (Fig. 1, A). The obturator was inserted with the soft rubber cylinder encircled by the anal canal. After the initial irritability of the sphincter caused by the insertion had subsided and the pressure due to the basic tonus noted, the patient was requested to close the sphincter with all possible force. The difference between the basic tonus and the greatest force exerted by the sphincter was used as an index of the strength of the voluntary sphincter. Table I shows the net increase of tonus during voluntary contraction of the anal sphincter in the 41 normal subjects examined by this method. These tests indicated

TABLE I.—MAXIMUM FORCE EXERTED ABOVE BASIC TONUS DURING VOLUNTARY SPHINCTERIC CONTRACTION IN CONTINENT SUBJECTS

Mm. mercury	No. cases	Per cent
10 or less	2	4.9
11 to 40	13	31.7
41 to 70	13	31.7
71 to 100	5	12.2
101 to 130	3	7.3
131 to 160	3	7.3
161 or over	2	4.9
Total	41	100.0

that the force exerted by the contracting sphincter could be maintained for only a very short time and, furthermore, that the strength of the voluntary sphincter contraction bore no apparent relation to sphincteric continence. Thus the maximum force of contraction varied from 9 millimeters of mercury in a 72 year old woman to 240 millimeters of mercury in a 45 year old man, yet both had perfect sphincteric control of gas and feces.

Methods II and III

These observations led to efforts to adapt the "colonmetrogram" described by White, Verlot, and Ehrentheil to the solution of this problem. A second, somewhat smaller obturator covered by a cylinder of soft rubber was constructed. The air space thus enclosed was connected to a blood pressure aneroid which was again used to indicate the pressure exerted by the contracting sphincter. The hollow center of the obturator was connected with a reservoir bottle containing water at approximately body temperature, by means of which an enema could be given. A vertical glass manometer with the zero point at the level of the anus was connected between the obturator and the reservoir. Increments of 100 cubic centimeters or 200 cubic centimeters of water were allowed to run into the colon at a constant rate of approximately 100 cubic centimeters per minute, after which the tube leading from the reservoir bottle was clamped and pressure readings on both manometers made (Fig. 1, B). The rapid fluctuations of colon and sphincter pressures made it impossible to secure accurate simultaneous readings, and the method was therefore adapted to kymographic recording (Fig. 1, C). With the kymographic method the fall-away bellows tambours and connecting tubes were filled with water to obviate errors that would otherwise occur from the compressibility of long columns of air. Electric recording (30) was found to be safe, clean, and to require a minimum of friction between the writing point and the drum.

The kymographically recorded combined colonmetrogram and sphinctermetrogram (colo-sphincto-metrogram) was obtained on 8 normal adults. Measurements of the kymographic tracings were used to construct summary charts of which Figure 2 is an example. The lower line, marked "A," is that of a normal colonmetrogram as described by White and associates. That is, the lowest colonic pressure recorded between increments of injected water was used to construct the base line. The vertical dotted lines extending upward from the base line indicate the maximum pressure recorded in this interval between injections, and represent the efforts of the colon to empty itself by peristalsis. The central shaded area marked "B" represents the activity of the colon during the injection of each increment. The pressure of the fluid injection (height of fluid in reservoir) was kept at a constant level (50 cm. in Fig. 2). As soon as each injection was started the needle recording colonic pressure immediately jumped to a point indicating a pressure of from 30 to 40 centimeters of water. This was followed by waves of increased pressure indicating colonic contractions which tended to resist the injection of each increment. These waves of "colon resistence"were usually accompanied by an increased desire to empty the colon. The subjective limit of tolerance to colon filling by retrograde injection is usually about 2000 cubic centimeters. It was noted that up to a volume of 600 or 800 cubic centimeters the injection of each increment was accompanied by a subjective desire to defecate and, at the same time, by evidence of peristaltic activity in resisting the injection. In about the middle third of the enema, that is from 600 or 800 to 1200 or 1400 cubic centimeters, each increment was attended with little or no peristaltic activity in resisting the

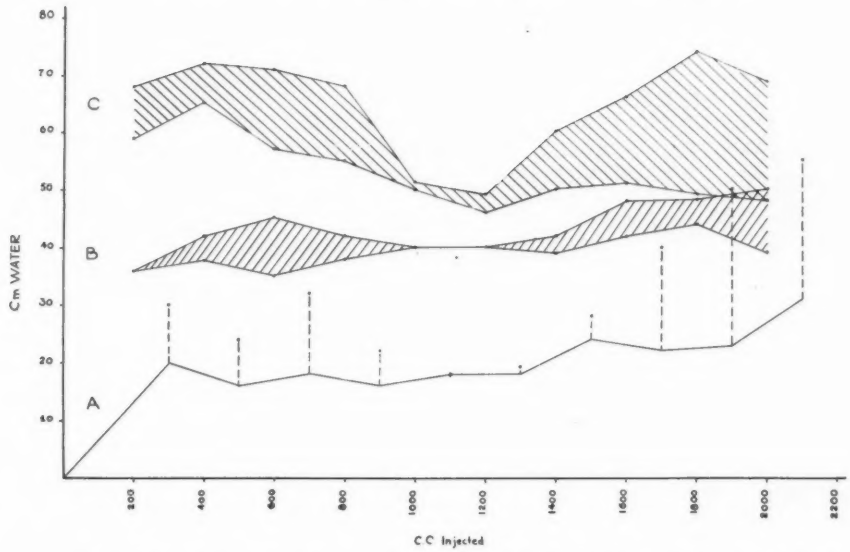

Fig. 2. The colo-sphincto-metrogram in a normal adult. A, Shows the activity of the colon in centimeters of water pressure following the injection of 200 cubic centimeter increments of water per anum. B, Shows the activity of the colon during the injections, and C, the activity of the sphincter during the injections.

injection, while during the injection of the last increments peristalsis again became active.

The activity of the sphincteric mechanism during the injection of each increment is indicated in the shaded area marked "C" which is bounded by points indicating the lowest and highest sphincter pressures recorded during each injection. The similarity of sphincter activity and colon activity during the injection is evident. Thus during the first third of the enema both the colon and sphincter are quite active. This activity diminishes during the middle third but increases again in the latter part of the enema. This correlation of sphincteric activity to changes in colonic pressure is also illustrated in Figure 3, made after the colon had been filled to the limit of toleration. The waves of increased colonic pressure (*C.P.*), corresponding to peristaltic waves, are associated with simultaneous increases of sphincter tone (*S.P.*). This correlation indicates that the sphincter responds by closing the anal canal only as the necessity for resistance to the propulsive peristaltic activity of the colon becomes necessary.

The necessity for this close correlation between peristaltic and sphincteric activity is evident from a study of the fatigue curves produced by voluntary sphincter contraction. These curves were obtained by placing the obturator across the entire anal canal, so that the resultant of all components of the sphincteric apparatus was recorded. After the sphincteric activity resulting from the insertion of the obturator had subsided, the patient was requested to contract the sphincter with all possible force and for as long a time as possible. Figure 4 illustrates typical fatigue curves. The initial contraction brought a rapid rise of sphincter pressure of but momentary duration and was followed by an irregular but progressive fall to the base line. Figure 4, A represents two separate voluntary sphincter contractions. At *X* in Figure 4, B the patient was urged to continue the contraction with all possible vigor and this encouragement resulted in some increased activity, followed by a fall of pressure which parallelled that following the initial effort. Table II shows the maximum pressure exerted by the

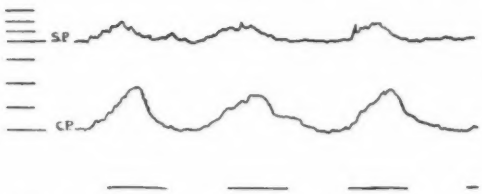

Fig. 3. Colon pressure, *C.P.*, and sphincter pressure, *S.P.*, recorded simultaneously after the colon had been filled with water to the limit of toleration. Time line equals 30 seconds.

voluntarily contracted anus as well as the time during which there was any sphincteric activity, however slight. An average maximum contraction of 44 centimeters of water pressure and an average duration of 52 seconds gives some indication of the fatigue curve of the normal voluntary sphincter. Introspection confirms the rapidity with which the voluntarily contracted sphincter fatigues and emphasizes again the necessity for correlation of sphincter tone to bowel activity in the maintenance of sphincteric continence.

Method IV

In an effort to evaluate the effects of local stimulation of the lower sigmoid colon and rectum on the sphincteric apparatus, as well as to differentiate the functions of the internal

TABLE II.—ANALYSIS OF SPHINCTERIC FATIGUE CURVES IN NORMAL SUBJECTS

Age	Sex	Maximum contraction in cm. H_2O	Maximum duration in seconds
12	F	50	90
24	M	35	18
28	F	47	65
40	M	30	40
40	M	37	40
46	F	32	30
48	F	30	60
48	F	60	70
50	M	66	45
52	M	50	55
61	F	32	33
62	F	38	40
70	M	66	84
Average		44 cm.	52 sec.

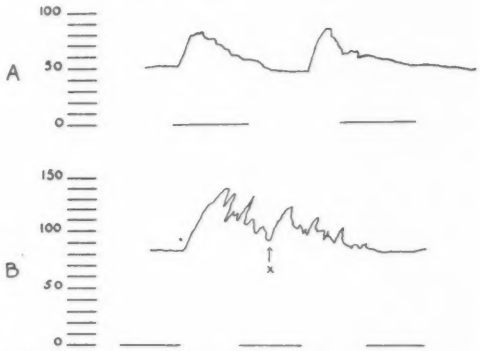

Fig. 4. Fatigue curves of voluntary sphincter contractions. Time line equals 30 seconds. Pressure scales in centimeters of water.

and external sphincters, the apparatus diagrammed in Figure 1, D was constructed. This consisted of a rubber balloon cemented to a graduated urethral catheter. The balloon was introduced into the sigmoid with the aid of a sigmoidoscope or into the rectum by digital manipulation. The end of the catheter was connected by a glass "T" tube to a 50 cubic centimeter syringe and a recording tambour. The balloon was distended with water by means of the syringe and pressure changes during and after filling were recorded kymographically. A small metal obturator was covered with a pliable rubber cylinder. The enclosed space was connected to a recording tambour and the system filled with water. By placing the obturator across the entire anal canal the combined activity of both sphincters was recorded while, by moving the obturator further in or pulling it partially out of the anal canal, fairly pure recordings of the pressure exerted by the internal or external sphincter could be obtained. The small catheter traversing the anal canal beside the obturator did not materially affect the recording of changes of sphincter tone.

The sensation resulting from distention of the balloon in various portions of the sigmoid and rectum was found to conform to the findings of Hertz. Distention of the balloon with 100 to 200 cubic centimeters of water when placed above the rectosigmoid junction (18 to 22 cm. above the anus) caused a pressure sensation which was referred to the lower abdo-

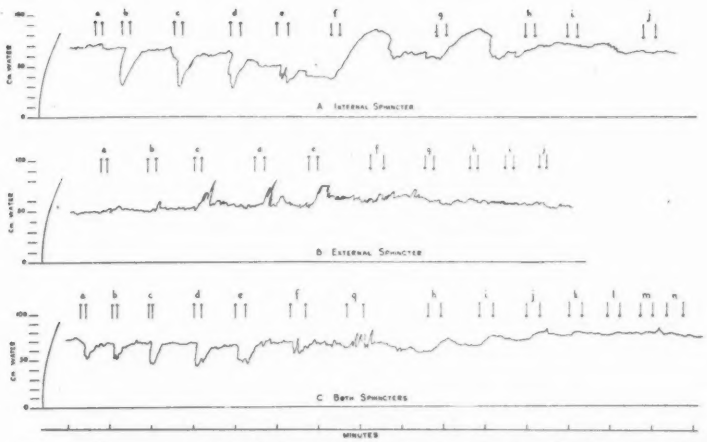

Fig. 5. The response of A, the internal sphincter, B, the external sphincter and C, both sphincters to the stimulus of a distended balloon placed in the rectum 10 centimeters above the anus. Arrows pointing upward indicate 50 cubic centimeter increments of filling. Downward arrows indicate 50 cubic centimeter decrements of emptying.

men, usually in the midline but at times in the left lower quadrant. Similar distention of the balloon placed just below the rectosigmoid junction (15 cm. above the anus) gave rise to a desire to defecate which was localized in the sacral and posterior perineal regions. As the balloon was moved closer to the anus the same amount of distention caused progressively increasing sacral or perineal sensations. It is probably a matter of practical importance that the anal reflexes (to be described) which result from stimulating the rectum by distention of the balloon, similarly vary in intensity according to the area of application of the stimulus. Thus, with the balloon in the sigmoid little or no reflex activity results. The responses progressively increase as the stimulating balloon is placed closer to the anus.

Since the anal reflexes occuring in response to distention of the balloon varied with its location, all tests were carried out with the center of the balloon at a constant level of 10 centimeters above the anus. Contrary to the findings of Garry (18), sufficient distention of the balloon was found to be an adequate stimulus for the production of the rectoanal reflexes. After numerous trials it was found that filling the balloon to 250 cubic centimeters by means of five increments of 50 cubic centimeters each gave responses that were consistent in different individuals and in different tests on the same individual. The tests were most satisfactory when done within a few hours after a normal evacuation.

Results. The response of the internal sphincter to the stimulus of a distended balloon in the rectum was obtained by moving the obturator into the anus until only its proximal half was recording, while its distal half protruded into the cavity of the rectum. When the obturator was placed across the entire anal canal, the kymographic tracing consisted of an irregular line with many sharp peaks and valleys representing minor but very rapid changes in muscle tone, changes characteristic of striated muscle. As the obturator was inserted further there was frequently an abrupt change in the character of the tracing which showed fewer and much slower changes in tone, giving rounded curves characteristic of smooth muscle contractions. Occasional sharp peaks of striated muscle contraction were noted at times, indicating partial overlapping of the internal sphincter by the external.

By careful attention to details it is possible to secure a response characteristic of the internal sphincter in nearly all normal adults. The characteristic internal sphincter response is shown in Figure 5, A. With the first increment of 50 cubic centimeters there may or

may not be a change of sphincter tone. Invariably with the second and succeeding increments, following a short latent period, there is a rapid but smooth fall of sphincter tone, represented by a dip of greater or lesser magnitude in the graph line. After the first such fall, the tonus usually returns promptly to its former level, but with each succeeding increment the tonus fails to return to its former level, and after five or more increments the tonus is invariably appreciably lower than it was when the test was started. Since the external sphincter overlaps the internal and since, as will be shown, the external sphincter tonus is rising while the internal is falling, with the last increments of the test there are frequently superimposed sharp momentary rises of pressure (*e* in Fig. 5, A).

On withdrawal of 50 cubic centimeters from the distended balloon there is a prompt rise of internal sphincter tonus which at times momentarily exceeds the initial tonus, but returns to the initial level after about 1 minute. The second withdrawal may be accompanied by a similar response but succeeding withdrawals are usually not accompanied by significant changes in internal sphincter tonus.

The characteristic *response of the external sphincter* is shown in Figure 5, B. This is obtained by withdrawing the obturator until its proximal half protrudes beyond the anal verge while its distal half is gripped by the external sphincter. It will be noted that the graph line is characteristically different from that of the internal sphincter, the line being roughly irregular with numerous sharp peaks and valleys representing the rapid change of tonus characteristic of striated muscle.

With the first two increments there is a slight but definite rise of sphincter tonus. With the third, fourth, and fifth increments there are sharp rises of sphincter tonus which return to the preinjection level soon after the injections are completed.

This contraction response of the external anal sphincter was always obtained when the patient was instructed to make voluntary efforts at fecal retention as the subjective urge to defecate increased with each succeeding increment. When the patient was instructed to relax and not consciously resist the urge to defecate, the response was frequently, but not invariably obtained. Co-operation in this matter was difficult to evaluate. Even when the contraction response was not obtained there was no fall of external sphincter tonus such as was seen with the internal sphincter.

The combined response of both sphincters. With the above background concerning the independent action of the internal and external sphincters it is evident that, in individuals willing fecal retention, the stimulus of a rapidly distended balloon in the rectum will cause changes in the tonus of the entire sphincteric mechanism which are the resultant of two forces: dilatation of the internal sphincter and contraction of the external sphincter. With the obturator placed across the entire anal canal, the graph of sphincter pressure shows changes characteristic of either sphincter, depending on which is dominant, and, most commonly the changes characteristic of both sphincters can be discerned. In the latter instance, the first few increments are frequently associated with a fall of sphincter pressure characteristic of the internal sphincter. As the balloon enlarges with succeeding increments and the urge to defecate reaches the level of consciousness and then becomes imperative, the character of the response changes to that of the external sphincter (Fig. 5, C). It is of some interest that the internal sphincter response is nearly always obtained with the first increments of filling, often when the patient has no conscious awareness of a rectal sensation, while the external sphincter response is often not obtained until rectal sensation is present. In some individuals the external sphincter is dominant throughout the test as in Figure 6, A, while in others the early increments cause no change in pressure, probably because the effects of the two sphincters cancel each other, while the later increments show an external sphincter dominance (Fig. 6, B).

Denny-Brown and Robertson have shown in human beings that the internal sphincter reflex returns after the period of the spinal shock has passed not only when the lumbar and thoracic portions of the spinal cord have been transected, but also following complete destruction of the sacral cord. Figures 6, C and 6, D are the responses obtained in an 18

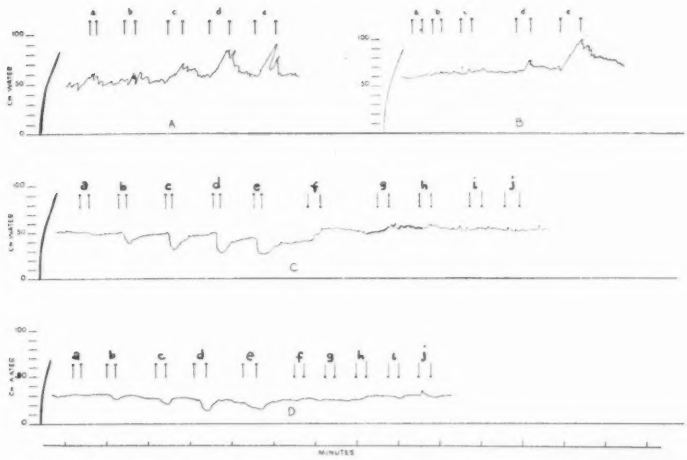

Fig. 6. A and B, The response of the entire sphincteric apparatus to the distention of a balloon in the rectum, 10 centimeters above the anus, in normal individuals. C, The response of the entire sphincteric apparatus to filling and emptying of a balloon in the rectum, 10 centimeters above the anus in a patient with transection of the spinal cord. D, Same as C but with the obturator placed across only the external sphincter. In all graphs arrows pointing upward indicate 50 cubic centimeter increments of filling of the balloon. Downward arrows indicate 50 cubic centimeter decrements of emptying.

year old female who suffered a complete transection of the spinal cord from a compression fracture of the eighth thoracic vertebra 14 months before the tests were done. With the obturator across the entire anal canal (Fig. 6, C) the response is similar to the internal sphincter response of a normal individual. With the obturator across only the external sphincter (Fig 6, D) the response is still that of the internal sphincter, although of lessened magnitude because there is less fluid displacement from the obturator which is now being compressed over only half of its surface. The internal sphincter response in this patient confirms the findings of Denny-Brown and Robertson in patients with transection of the spinal cord. With transection of the spinal cord the normal internal sphincter response, together with the absence of an external sphincter response, indicates that (1) cerebral connections are necessary for the execution of the external sphincter reflex, although whether these connections must be made at the conscious level is not clear; and (2) the internal sphincter response is independent of cerebral connections.

Method V

Proof that the curves described above represent respectively the function of the internal and external sphincters is seen in the results of experiments done with the apparatus shown in Figure 1, E. With this method tests were conducted in exactly the same fashion as described for method IV except that a metal septum was fixed in the middle of the obturator dividing it into distal and proximal compartments. Each compartment was connected for independent kymographic recording. With the metal septum placed at about the midpoint of the anal canal it was possible to record simultaneously the separate responses of the internal and external sphincters.

Figure 7 illustrates the effects of stimulation of the rectum on each of the sphincters recorded simultaneously. With each increment of filling of the balloon there is a rise of external sphincter pressure which falls to the base line soon after the injection is completed. As the balloon becomes more distended and conscious rectal sensation (which in this instance started at 80 c.c.) becomes more marked, the elevation of external sphincter pressure with

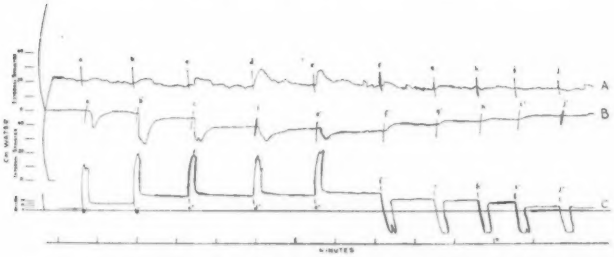

Fig. 7. The responses of A, the external sphincter and B, the internal sphincter resulting from filling and emptying a balloon placed in the rectum 10 centimeters above the anus in a normal individual. Line C shows 50 cubic centimeter increments of filling (*a''* to *e''* inclusive) followed by similar decrements of emptying (*f''* to *j''* inclusive).

each succeeding increment is higher and lasts somewhat longer. No constant effect on the external sphincter is noted with emptying of the balloon. At the same time that the external sphincter pressure is rising, the internal sphincter pressure is falling. Following the first increase of balloon volume the internal sphincter pressure returns promptly to its pre-injection level. Following the second and succeeding increments, however, it does not return to the pre-injection level so that there is a progressive fall. With each reduction of volume of the balloon there is a rise of internal sphincter pressure which, after the balloon is empty, regains its original level.

Voluntary increase of rectal pressure as by straining to evacuate causes a fall of internal sphincter pressure similar to that accompanying distention of the balloon. Usually such an effort is accompanied by a rise of external sphincter pressure as shown at *b* in Figure 8, A. It is difficult to secure satisfactory co-operation of the patient in voluntary straining to defecate because of fear of embarrassment, and this almost certainly accounts for the rise of external sphincter pressure noted under these circumstances. Figure 8, B, *b'*, a tracing made with the single obturator across both sphincters, shows relaxation of the entire sphincter mechanism on straining to defecate. As the pressure falls, small jerky waves of contraction characteristic of the external sphincter are noted. During reflex increases of intra-abdominal pressure such as during coughing or sneezing, the external sphincter contracts with such speed and vigor that no internal sphincter relaxation is recorded (*a* and *a'* in Figures 8, A and 8, B).

DISCUSSION

The findings described here indicate that in normal individuals anal continence is the result of a fine co-ordination between the rectum and the external anal sphincter. This co-ordination is mediated through reflexes involving both the autonomic and somatic nervous systems and initiated by impulses which arise in the wall of the rectum. The receptor mechanism may lie within the mucosa of the rectum, since the reflexes are abolished by the application of cocain to the rectal mucosa (18), but more likely lies within the muscular wall, a point that requires further elucidation. Since the rectoanal reflexes become progressively more active the more distally the rectal stimulus is applied, it is probable that the receptor units, while present over entire length of rectum, increase in number from above downward and are most numerous in that part of the rectum which lies immediately above the anal canal.

Afferent fibers arising in the wall of the rectum probably normally communicate through the spinal cord with efferent fibers innervating the internal anal sphincter since its reflex is abolished during periods of "spinal shock." This reflex arc is independent of cerebral centers since it is not abolished when the spinal cord is transected in the lower dorsal region. Since it eventually returns after destruction of the sacral cord in man (12) and following resection of the spinal cord in experimental animals

(38) it is also evident that spinal connections are not essential. The response of the internal sphincter to stimulation of the rectum is invariably one of relaxation and, perhaps, active dilatation of the anal canal, which is thus prepared for the passage of fecal material. Under normal circumstances the internal sphincter probably contributes something to the tonic closure of the anus in the absence of rectal stimulation. However, when the rectum is stimulated, whether the urge to defecate reaches conscious levels or not, the internal sphincter dilates, preparing the way for evacuation, and contributes nothing to the act of voluntary restraint.

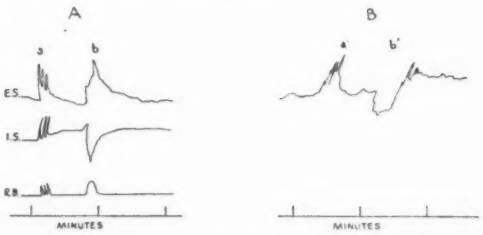

Fig. 8. A, External sphincter tonus, *E.S.*, internal sphincter tonus, *I.S.*, and pressure in rectal balloon, *R.B.*, recorded independently and simultaneously by method V. At *a* patient coughed three times. At *b* he strained as to defecate. B, Single obturator across entire anal canal (method IV); at *a'* cough, at *b'* strain as to defecate.

The typical response of the external anal sphincter to stimulation of the rectum is one of contraction. This reflex is mediated through higher nervous centers and is therefore abolished by transection of the spinal cord. Since the typical external sphincter reflex was obtained in a patient who was asleep and had no memory of desire to defecate when the rectal balloon was inflated, it is probable that afferent impulses need not reach the level of consciousness. Study of fatigue curves of the external sphincter indicates that it is capable of maximal contraction for only very short periods and that voluntary contraction cannot usually be maintained by normal adults at a submaximal level for periods longer than one minute. Furthermore Denny-Brown and Robertson have shown that with voluntary restraint there is no damping of waves of rectal contractions which are present when defecation is imminent. These facts indicate that the mechanism of sphincteric continence involves only the external anal sphincter and the rectum. The former reflexly or voluntarily contracts to resist the propulsive force of the contracting colon and rectum, unaided by inhibitory effects on colon or rectum. Because of the ease with which the external sphincter fatigues, the necessity for a close correlation between rectum and external sphincter is evident, and the rectum itself must, therefore, be considered an integral part of the sphincteric mechanism. The relatively slow propulsion of fecal material by peristaltic activity of the smooth muscle of the colon gives ample time for the rapidly acting striated muscle of the external anal sphincter to contract with appropriate force.

Sphincteric continence will, therefore, be lost with any type of injury which interferes with the function of the external anal sphincter, and such injury may be effective in several different ways. Surgical, puerperal, or traumatic injuries resulting in complete division of the external sphincter are the commonest source of sphincteric incontinence. Here the divided muscle is unable to control the entire circumference of the anus. All other causes of sphincteric incontinence are essentially neurological in origin and operate by breaking up the co-ordination made possible by the nerve connection between the rectum and the external sphincter. This reflex co-ordination may be broken at any of its vulnerable points, the most common of which is transection of the spinal cord which operates by preventing the completion of the reflex arc through higher centers.

It would appear that when the sphincters are preserved following resection of the rectum for malignancy, sphincteric continence may be lost in either of two ways: (1) By injury to the somatic nerve supply (inferior hemorrhoidal nerves) to the external sphincter as may occur when the sacrum is resected at or above the level of its third foramina. Similar injury may occur when the levator ani muscles are divided lateral to the rectum, since the nerves are closely applied to the inferior surfaces of these muscles. (2) By destruction of the afferent fibers arising in the rectal wall. This is a matter of great practical

importance and will be made the subject of a future communication.

SUMMARY AND CONCLUSIONS

1. Fecal continence may be conveniently classified as:

a. Colonic continence, which depends on the plastic adaptation of the colon to the enlarging fecal mass. This is retained by patients with abdominal colostomy as well as by those in whom the sphincters have been preserved following resections of the rectum.

b. Sphincteric continence, a term which indicates the active contraction of the anal sphincters which thereby resist the propulsive force of colonic peristalsis.

2. Pertinent facts relative to the anatomy of the sphincteric apparatus are reviewed.

3. Five methods designed for the study of the sphincteric apparatus are presented.

4. The results of a study of the physiology of the sphincteric apparatus by these methods indicate that:

a. Stimulation of the rectum causes the internal sphincter to dilate and to thereby prepare the way for evacuation.

b. The internal sphincter plays no part in sphincteric continence. Only the external anal sphincter and rectum are concerned with sphincteric continence.

c. Sphincteric continence is not a simple pursestring effect. The actively contracted external anal sphincter rapidly becomes fatigued; because of this its activity must be delicately correlated to colonic activity.

d. The correlation of sphincteric to colonic activity is mediated through a nervous reflex. The afferent fibers of this reflex arise in the wall of the rectum and communicate with efferent fibers terminating in the external sphincter. The connection between afferent and efferent fibers takes place at cerebral levels.

e. The rectum itself must be considered an integral part of the sphincteric apparatus.

5. Sphincteric continence may be lost under the following circumstances:

a. Complete division of the external sphincter.

b. Transection of the spinal cord.

c. Surgical injury of the efferent fibers to the external sphincter (inferior hemorrhoidal nerves).

d. Removal of the afferent fibers of the rectoanal reflex by resection of all of the rectum.

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SURGERY IN BLEEDING PEPTIC ULCER

Urgent Operation and the Principle of Exclusion

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THE purpose of this report is twofold: first, to examine the need for surgery during the active bleeding stage of bleeding peptic ulcer, and, second, if such a need is established, to describe a program for handling these patients. The program has as its two main features urgent operation in selected cases, and the exclusion of the ulcer when such an ulcer is technically difficult or hazardous to remove. These principles have been advocated by Finsterer (15), by Allen (3), by Gray and Sharpe, by Ameline and Gilbert, and by others. By defining a program based on these principles and by illustrating it with individual case reports, we hope to accomplish a further clarification of the fundamental issues involved.

During the year July 1, 1946 to June 30, 1947, 219 patients with a diagnosis of peptic ulcer were discharged from the Veterans Hospital, West Roxbury, 54 of whom either entered with the symptoms of hemorrhage or developed it after admission. Our experience with these patients forms the basis of the report.

THE NEED FOR SURGERY IN BLEEDING ULCER

A study of the literature leads one to the conclusion that reports on the frequency of hemorrhage in peptic ulcer, in order to be informative, must be qualified by descriptions not only of the severity of the hemorrhage considered but also of the total cases studied. Thus we find in the literature (2, 4, 18, 19, 26, 27, 29, 30) that among hospital admissions for ulcer, hemorrhage of any degree is reported as ranging between 11 per cent and 40 per cent of the cases. The incidence in our series was 24.6 per cent. In this same group, massive hemorrhage (entailing anemia below 3,000,000 red blood cells per cu. mm.) was recorded in the literature as between 9 per cent and 18 per cent of cases, the incidence in our series being 13.2 per cent. Furthermore, if one considers, as Stolte did, a group of patients other than those admitted to hospitals, for example, all patients in the population suffering from peptic ulcer, one finds that the reported incidence of hemorrhage of any degree is 56 per cent.

To be significant, then, a reported mortality rate in bleeding ulcer cases must be qualified by clearly showing whether the group considered is made up of patients with hemorrhage of *any* degree, or only those with massive hemorrhage. The wide range of mortality as reported in the literature (2, 9, 10, 15, 18, 19, 23, 25, 27, 29, 30), namely 3 per cent to 25 per cent, is largely explicable on this basis. In discussing surgical mortality it is vital to know not only the degree of hemorrhage but at what time during the course of bleeding the operation was undertaken. The varying mortality rates following surgery for bleeding peptic ulcer (1, 7, 15, 16, 17, 19, 23, 28) which range from 4.1 per cent to 42.8 per cent seem, after careful scrutiny of the reports, to be explicable solely on the varying degrees of exsanguination of the patients at the time of surgery.

The greater seriousness of massive hemorrhage from peptic ulcer in patients past middle life has been testified to by many. Reports in the literature state that between 20 per cent and 33.3 per cent of such patients will die, and that of all deaths from hemorrhage in ulcer patients 95 per cent are in this older age group (2, 6, 23, 29).

In summary, it can be stated that approximately 50 per cent of peptic ulcers bleed to some degree during the patient's life, that 25 per cent of hospital admissions for peptic ulcer have bleeding as one of the admission symptoms, and that approximately 10 per cent of

From the Surgical Service, Veterans Hospital, West Roxbury, Mass., and the Department of Surgery, Harvard Medical School.
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TABLE I.—TYPES OF OPERATION FOR BLEEDING ULCER

1. Posterior gastroenterostomy (Mikulicz)
2. Posterior gastroenterostomy with ligature of the pylorus (Finsterer)
3. Above procedures plus tamponade of the duodenum (Finsterer)
4. Ligation of pancreaticoduodenal artery plus direct plication of the ulcer (Allen)
5. Excision of ulcer (Finsterer, Heuer)
6. Exclusion operation (Devine, Finsterer, Gray and Sharpe, Allen)
7. Subtotal gastric resection with excision or exclusion of the ulcer (Finsterer, Allen, Walters and Cleveland, Heuer)

all such admissions have massive hemorrhage. The mortality in all patients who are admitted for massive hemorrhage and treated by conservative methods is between 5 per cent and 10 per cent. In the older patients this figure may rise as high as 33.3 per cent. The mortality following surgery for bleeding ulcer may be below 5 per cent if patients operated upon at an elective time are included in the group, but it has approached 50 per cent if one considers only those in a state of exsanguination and on whom surgery followed a prolonged and unsuccessful attempt at conservative management.

Under current methods of conservative treatment, therefore, one or two of every 20 patients admitted with massive hemorrhage from peptic ulcer will die. These patients are almost invariably in the older age group. It is they who establish a need for surgery in the treatment of bleeding peptic ulcer.

SURGICAL MANAGEMENT

A. Urgent operation. Since the mortality following surgery seems to be directly dependent upon the degree of exsanguination of the patient at the time of operation, we have found it useful to separate operations done during different phases of exsanguination into three categories, namely, emergency, urgent, and elective. Emergency operations are those undertaken to stop hemorrhage in patients already in a state of shock in whom it has not been possible before operation to restore the blood volume or to correct, even partially, the acute anemia. Urgent operations are those performed to stop hemorrhage or to prevent recurrence of hemorrhage in patients who are not in shock but in whom it has not been possible preoperatively to correct completely the anemia, the hypoproteinemia, or other factors, such as upper respiratory infections, which may increase the operative risk. Elective operations are those performed to rid the patient of the ulcer after a considerable period of time has elapsed following the cessation of hemorrhage and in whom all the aforementioned deficiencies have been corrected.

Although some disagree (29, 30), it is the testimony of many observers (2, 8, 13, 18) that, whereas massive hemorrhage which is indistinguishable from that in the early course of a fatal hemorrhage can arise from a small anterior wall gastric or duodenal ulcer, the patients who die are those whose bleeding comes from ulcers which are eroding large arteries, namely, the pancreaticoduodenal and the right and left gastric arteries. Apart from demonstrating by roentgenogram that the ulcer lies in one of these areas, and from taking into account the patient's age, there is, as yet, no satisfactory method for deciding, early in the course of the hemorrhage, which patients will stop bleeding on conservative treatment. Since the use of an unduly prolonged trial of conservative therapy in making this decision will occasionally leave one with an exsanguinated patient upon whom one is forced to perform an emergency operation and with it accept only a 60 to 70 per cent chance of survival, we have used earlier operation on a larger group in order to avoid this eventuality. Specifically, we have advocated and performed the urgent operation for any patient over 45 years of age who continues to bleed massively from a proved peptic ulcer for more than 24 hours after admission, or who, having bled massively and stopped, has shortly thereafter bled again.

B. Exclusion of the ulcer. The types of operation that have been advocated for bleeding ulcer are outlined in Table I. We have adopted as the ideal operative program a subtotal gastrectomy which entails removal of the lower two-thirds of the stomach including the pylorus, followed by the re-establishment of bowel continuity by an end-to-side gastrojejunostomy. Removal of the ulcer may be safely accomplished as part of this procedure

if it is on the anterior surface of the stomach or duodenum. If the ulcer is on the posterior surface and is penetrating the pancreas or gastrohepatic ligament, however, we have considered the additional procedure of removal of the ulcer too formidable to undertake in these patients. In such circumstances, therefore, we have performed exclusion of the ulcer on the assumption that diversion of the gastrointestinal stream from its surface will avoid repeated digestion of the normal clot which forms within it.

There is evidence to show that even in the most severe bleeding from ulcer, clotting will occur intermittently during its course, but that this clot will be redigested by the gastric juice passing over it. First, in fatal cases death does not occur until some time has passed. Allen found that in 20 fatal cases the average length of time from onset to death was 16 days. Chiesman reports that in 46 fatal cases none died within the first 48 hours. Thorstad found the average period in the hospital of all fatal cases to be 6 to 10 days. It is difficult to believe that uninterrupted continuous bleeding would have allowed patients to survive for these periods even with the aid of multiple transfusions. Second, Finsterer reports in a large group of cases that the ulcer is usually not bleeding at the time surgery is undertaken but contains a soft clot in a vessel in the ulcer base. On the basis of this evidence we have proceeded on the assumption that exclusion of the ulcer from the action of the gastric juice is the one most important factor in preventing recurrence of hemorrhage.

Of our 54 patients who had bleeding from peptic ulcer, 29 were considered to have a massive hemorrhage (red blood corpuscles below 3,000,000 per cu. mm.). Twenty of these 29 bled rapidly and seriously. Of this 20, 10 continued to bleed or, the bleeding having stopped, bled again. Of these 10, 4 were over 45 years of age and, having proved peptic ulcers, received urgent operation. Their postoperative courses were satisfactory and there were no deaths. Of the 4 patients operated upon, 1 had a small anterior wall duodenal ulcer, bleeding from which probably would not have been fatal. A subtotal gastric resection with excision of the duodenal ulcer was performed. A simultaneous cholecystectomy and choledochostomy was also carried out because of the incidental discovery of gall stones. In the other 3 cases the ulcers were of the posterior penetrating variety and had eroded large arteries. Each ulcer was treated by exclusion. Since they presented three different problems in technical management illustrative of the three types of situation which call for exclusion rather than excision, they are reported in detail.

CASE REPORTS

CASE 1. The patient was a male steam-fitter, aged 53 years, who entered the hospital on May 29, 1947, because of melena of 1 week's duration and because of a fainting attack on the morning of admission.

Past history disclosed that the patient had had a diagnosis of peptic ulcer made in 1934 at another hospital following admission there for abdominal pain. At a second hospital admission in 1940 and following another x-ray examination of his stomach he was told that he had a duodenal ulcer. Since that time he had had symptoms typical of ulcer and 3 weeks prior to the present admission he had an exacerbation of his epigastric pain which continued steadily until admission.

On admission the patient was extremely pallid and was mentally confused so that an adequate history was difficult to obtain. The blood pressure was 120/80, the pulse 110, and the temperature 101.4 degrees. The physical examination was otherwise negative.

The red blood cells were 2,200,000 per cubic millimeter and the hemoglobin 8.4 grams. Urine sediment showed 7 white blood cells per high power field, and there were 4 to 6 granular casts per low power field.

The patient was placed on a diet consisting of two-hourly feedings of milk and cream and was given dilaudid and sodium luminal for sedation, and during the succeeding 2 weeks he received 4,000 cubic centimeters of blood intravenously. He continued to pass tarry stools, all showing a 4 plus test for occult blood. The red blood count and hemoglobin fell during the first 3 days to 1,900,000 and 5.4 grams, respectively, but 6 days later had risen to 3,400,000 red blood cells and 7.9 grams of hemoglobin, when they again fell to 2,400,000 red blood cells and 7.9 grams of hemoglobin. Gastrointestinal x-ray examination performed on May 30, the day after admission, showed a large diverticulum, 5 by 6 centimeters on the lesser curvature of the stomach, a thickening of the gastric rugae with folds radiating toward the diverticulum, a deformed duodenum with a large diverticulum projecting from its greater curvature side, and a third diverticulum projecting to the left of the descending portion of the duodenum.

Because of the patient's continued or persistent bleeding, he was operated upon on June 14, 15 days

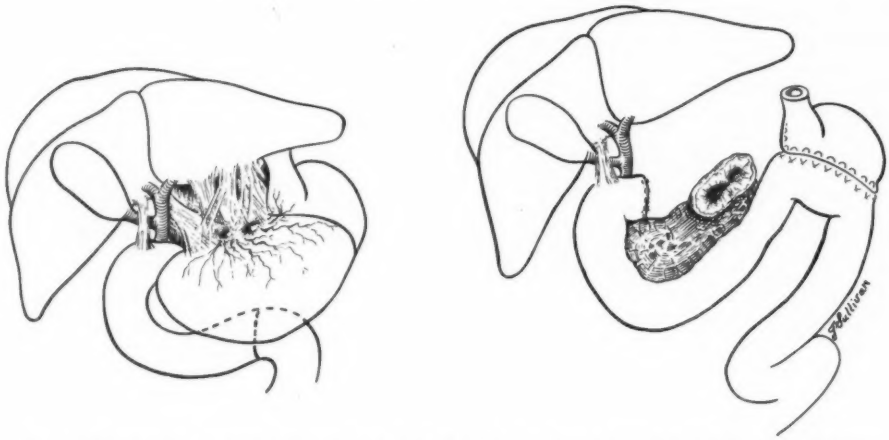

Fig. 1. Diagram of the operative procedure in Case 1. A standard subtotal gastric resection was performed removing the distal three fourths of the stomach including the pylorus. The gastric ulcer is shown remaining *in situ* against the pancreas but excluded from the gastrointestinal tract.

after admission. A subtotal gastrectomy was performed removing the lower three fourths of the stomach including the pylorus. A Hofmeister type of anastomosis was effected anterior to the colon. An ulcer 2.5 by 5 centimeters was found to be eroding the upper edge of the pancreas and the left gastric artery. This ulcer was not actively bleeding at the time and it was left *in situ* but excluded from the gastrointestinal tract (Fig. 1). It was apparently the cause of the diverticulum seen in the roentgenogram. The duodenum, contrary to the diagnosis made by means of the x-ray, seemed normal.

The patient's convalescence was smooth. He received 500 cubic centimeters of blood on the day following surgery and another 500 cubic centimeters 11 days later. The red blood cells were 4,300,000 per cubic millimeters 14 days after operation with 12.5 grams of hemoglobin. The first stool passed after operation was of a tarry nature but subsequent stools were brown and on the eleventh postoperative day the guaiac test for occult blood had changed from 4 plus to 2 plus.

The case is that of a large gastric ulcer penetrating the pancreas which bled persistently and massively for a period of 3 weeks. Diagnosis by means of the x-ray had been made during the episode of bleeding. Urgent surgery was performed 15 days after admission. A standard subtotal gastric resection was performed removing the lower three fourths of the stomach including the pylorus. The ulcer was left *in situ* in the pancreas but excluded from the gastrointestinal tract.

CASE 2. A 55 year old male automobile mechanic entered the hospital on December 10, 1946, because of a 3 day story of tarry stools, hematemesis, and weakness. Three days before admission the patient began to have severe epigastric pain. Two nights before admission he was awakened in the morning by severe pain which was followed by syncope, by the vomiting of considerable quantities of black material, and by the involuntary passage of black stools. The patient was disoriented after recovering consciousness.

One year prior to entry the patient had passed tarry stools and had had a period of 2 days of "weakness." He had had a chronic cough for many years, and was admittedly a heavy drinker. He said that he had had "arthritis" for 7 years.

He showed marked pallor but was mentally clear. The temperature was 98.6 degrees, the pulse 80, and the blood pressure 120/80. There was marked tenderness in his midepigastrium.

The red blood cells were 2,500,000 per cubic millimeter with 7 grams of hemoglobin. Urine was normal, blood nonprotein nitrogen 41 milligrams per 100 cubic centimeters, and the blood glucose 67 milligrams per 100 cubic centimeters. The serum protein was 8.4 grams per 100 cubic centimeters.

The patient was placed on an ulcer diet with three-hourly feedings and was given sodium luminal and atropine. On the day following admission his temperature rose to 102.8 degrees and his pulse to 119. He complained of more pain and vomited bile-stained material which was not bloody. A course of penicillin injections was started and his temperature subsided on the fourth hospital day, although his pain continued. On the third, fifth, and sixth day in the hospital the patient had massive melena and on the sixth day he went into shock, the blood pressure

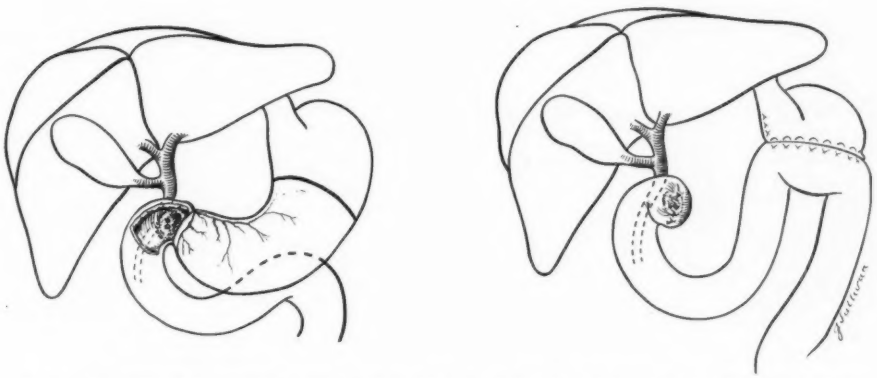

Fig. 2. Diagram of the operative procedure in Case 2. A standard subtotal gastric resection was performed removing the lower three fourths of the stomach including the pylorus. The duodenal ulcer is shown remaining *in situ* posteriorly within the duodenum immediately distal to the duodenal "stump." It remains in the gastrointestinal tract but is excluded from the gastrointestinal stream.

falling to 80/60 and his pulse rising to 120, the hemoglobin this day being 7 grams. He had received 1,500 cubic centimeters of blood during the 6 days following admission. Because of this recurrent hemorrhage the patient had an emergency gastrointestinal x-ray series on the fourth day in the hospital at which time a duodenal ulcer was visualized.

On the seventh day after admission urgent operation was performed. The patient was found to have a posterior wall duodenal ulcer about 1.5 centimeters in diameter and 2 centimeters distal to the pylorus. In the center of this ulcer was a hard cartilaginous nipple at the apex of which was an open blood vessel which was not bleeding. A subtotal gastrectomy was done, a posterior Hofmeister type of gastrojejunostomy being used. The gastroduodenal segment was transected just distal to the pylorus and the duodenum turned in so that the turned-in tuft of duodenum lay in the ulcer crater (Fig. 2). The patient received 1,000 cubic centimeters of blood on the day of operation.

Convalescence was smooth. The patient received 500 cubic centimeters of blood on the second postoperative day. By the tenth day the red blood cells were 3,700,000 and hemoglobin 12 grams. There was no external evidence of further bleeding.

The case is that of a large posterior wall duodenal ulcer which bled recurrently and massively for 10 days prior to surgery. The diagnosis was made by means of x-ray examination carried out during the bleeding episode. Urgent operation was performed, the gastroduodenal segment being transected between the pylorus and the ulcer which was excluded and left *in situ* in the duodenum, distal to the turned-in duodenal stump.

CASE 3. A 49 year old male post office inspector entered the hospital on May 29, 1947, because of progressive weakness over a period of 5 days, associated with melena and hematemesis.

His illness started 2 weeks before admission when he began to have severe epigastric and left upper abdominal pain which was not relieved by food or antacids. Five days later this pain became more noticeable in the chest, rising behind the sternum into the throat. At this time he first noticed tarry stools. Four days before admission he had hematemesis and had two more subsequently with continued tarry stools.

The patient had ulcer symptoms for 16 years and in 1938 an x-ray examination showed a duodenal ulcer but there had been no previous hemorrhages, and no symptoms of perforation or of pyloric obstruction had been present.

Physical examination showed extreme pallor of the skin, restlessness, deep sighing respiration, and there was dried blood about the nostrils and mouth. Blood pressure was 90/50 and pulse rate 120.

Laboratory studies revealed a hemoglobin of 5 grams and a urine which was negative except for a 1 plus positive test for acetone and 5–10 white blood cells per high power field in the sediment. Blood leucocytes were 23,000 per cubic millimeter.

The patient was put on a milk and cream diet, and phenobarbital and atropine. He received 1,000 cubic centimeters of blood on the day of admission and 1,500 cubic centimeters from the second to the fifth day. The pain in the epigastrium continued and was quite severe. He vomited a small amount of blood on one occasion. The red blood cells rose to 3,500,000 and the hemoglobin to 6.9 grams by the fifth day in the hospital when he vomited 300 cubic centimeters of coffee-ground material and 600 cubic centimeters more was removed from his stomach by aspiration. The red blood count fell again to 2,500,000 red cells.

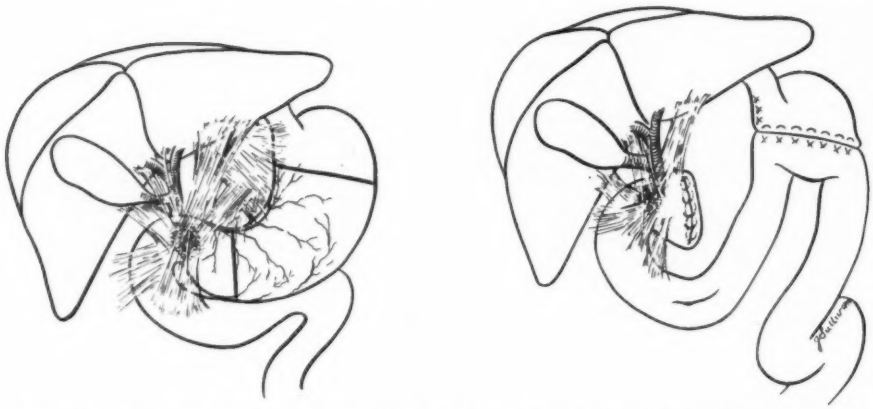

Fig. 3. Diagram of the first operative procedure in Case 3. A subtotal gastric resection was performed removing the distal three fourths of the stomach including the pylorus in two stages. The first stage is shown here. The stomach is transected 8 centimeters proximal to the pylorus and the distal cut end closed in. The duodenal ulcer surrounded by a large inflammatory mass is shown excluded from the gastrointestinal stream as in Case 2.

On the sixth day an emergency gastrointestinal roentgenogram was taken which showed the large crater of an ulcer in the region of the pylorus.

On the sixth hospital day, operation was performed. There was found an inflammatory mass 8 centimeters in diameter in the region of the pylorus. The first stage of a two stage subtotal gastrectomy was performed, the gastric antrum being transected 3 inches proximal to the pylorus and closed in. There was no evidence of fresh blood in the stomach, but visualization of the ulcer crater through the pylorus could not be obtained. The middle half of the stomach was resected and a posterior Hofmeister gastrojejunostomy performed (Fig. 3). During the morning prior to operation 1,500 cubic centimeters of blood were given during and following operation.

Convalescence was satisfactory. The red blood cells on June 6, 1947, two days after operation, were 4,500,000 per cubic millimeter and the hemoglobin 11.8 grams. The stools were positive for occult blood on the first few days after operation but on the twelfth postoperative day they were negative for occult blood. The patient was discharged on the seventeenth postoperative day.

He returned to the hospital on July 23, 1947, forty-nine days after the first stage operation and a second stage gastrectomy was performed 2 days later. At this operation the inflammatory mass had apparently completely subsided. The removal of the antrum, the pylorus and the scar of duodenal ulcer, now about 2 centimeters in diameter with a turn-in of the duodenum distal to the ulcer, was easily performed. The convalescence was uneventful.

The case is that of a large posterior wall duodenal ulcer associated with a large inflammatory mass. The patient had had symptoms of severe ulcer activity for 3 weeks with recurrent massive hemorrhage for 12 days prior to surgery. Urgent first stage gastrectomy was performed excluding the ulcer but not excising it. Later, a second stage gastrectomy with removal of the ulcer was carried out.

DISCUSSION

These 3 cases represent three types of situation that may arise when the ulcer is difficult to remove. In Case 1, the penetrating gastric ulcer, the ulcer could be completely excluded from the intestinal tract although it was left *in situ* in the pancreas. In Case 2, the penetrating duodenal ulcer situated some distance from the pylorus, the gastroduodenal segment could be transected between the pylorus and the ulcer which was left *in situ* in the duodenum. In Case 3, the penetrating duodenal ulcer which caused the large juxtapyloric inflammatory mass, the gastroduodenal segment was transected proximal to the pylorus and at a later second stage the removal of the gastric antrum and the pylorus was done in the manner advocated by McKittrick. In Cases 2 and 3, although the ulcers were left *in situ* within the intestinal tract, they were effectively excluded from the intestinal stream and no further bleeding occurred.

We realize that early operation in these older patients, which is advocated to forestall a fatal outcome in a minority of cases, does subject to operation a larger number of patients whose bleeding might have stopped had conservative treatment been continued. We, therefore, feel that to justify the adoption of this more radical policy, it must satisfy 5 criteria: (1) it must stop active hemorrhage and prevent recurrent hemorrhage; (2) it must entail the use of the simplest possible operative procedure; (3) this operative procedure must give the patient as complete protection against recurrent or marginal ulcer as would a later elective operation; (4) it must not submit to operation patients in whom there would be no indication for later resection assuming the hemorrhage could be successfully treated by conservative means; (5) it must not result in a mortality rate higher than that expected for the elective surgery of peptic ulcer in a similar age group.

We consider criterion 1 to be satisfied by the exclusion of the ulcer from the gastrointestinal stream; criteria 2 and 3 by resorting to exclusion of the ulcer or the two stage operation under the indications outlined, and 4 by the group selected, most of whom, being older patients with severe hemorrhage, would be recommended for elective surgery at a later date supposing the hemorrhage to have been successfully treated by conservative means. Whether criterion 5 is fulfilled under this policy cannot be told until a large selected group of these patients is analyzed and comparable mortality rates determined. Our experience with these few cases has been most favorable and we believe justifies a continuance of the policy.[1]

The credit for advocating the exclusion operation in selected cases of bleeding belongs to Finsterer, to Gray and Sharpe, and to Allen. We should mention here a point which needs further emphasis. If an exclusion operation has been performed which entails leaving any part of the gastric antrum *in situ*, this remnant of the antrum should be removed at a later date in order to avoid a marginal ulcer. The high incidence of jejunal ulcer following gastric resections in which antral mucosa has been left *in situ* has been recognized by many. The removal of the antrum at a second stage following the performance, in selected cases, of a first stage exclusion operation has been advocated by McKittrick. We feel, with him, that the term "first stage gastrectomy" is in these cases preferable to "exclusion operation."

The credit for advocating early operation undoubtedly belongs to Finsterer who apparently operated on all massive bleeders within 48 hours after onset. We have considered our more rigid selection of cases, however, as preferable to his broader indications.

We have not adequately discussed the technique of management of patients who, at operation, are found to be actively bleeding from the ulcer bed. We feel that under a policy of urgent surgery for the older age group, few such situations will arise. It is undisputed that when such an occasion arises, an attack of some sort on the bleeding vessel must be made. Access to the ulcer bed is available directly in such situations as those illustrated by Case 1, and indirectly through the transected duodenal stump in such a condition as is illustrated by Case 2. In these cases by direct application to the ulcer of pressure or of hemostatic agents such as muscle, fibrin foam, or gelatin sponge, the bleeding can readily be stopped. The situation is then identical with that in which the bleeding was not in progress when the abdomen was opened, and exclusion of the ulcer can be performed. If active bleeding is in progress from the ulcer when the situation is as outlined in Case 3, one must decide at operation whether to rely on the exclusion procedure to permit the formation of a clot, or whether a direct attack through an incision in the anterior face of the gastroduodenal segment is needed. It is our opinion that the latter will rarely be necessary. If it is undertaken, however, the technique of reconstructing the duodenum and antral remnant as described by Allen should be used.

SUMMARY AND CONCLUSIONS

The use of methods of nonsurgical treatment of massive bleeding from peptic ulcer which have been produced to date has always resulted in a small percentage of cases which

[1]Since this group was studied 6 more patients have received urgent operation without mortality.

come to the surgeon because these medical measures have failed. In these cases, especially if there has been a prolonged trial of such a medical regimen, the postoperative mortality is high.

Early "urgent" operation is, therefore, advocated on all patients with massive hemorrhage from peptic ulcer who are over 45 years and in whom the hemorrhage persists after 48 hours following admission to the hospital or having stopped, recommences.

Subtotal gastrectomy with removal of the lower two-thirds of the stomach, including the pylorus, should be the surgical plan for these patients.

In those patients in whom the ulcer is technically difficult to remove, a subtotal gastrectomy with exclusion, but not removal, of the ulcer is advocated. In patients with a large inflammatory mass involving the pylorus and duodenum, a two stage subtotal gastrectomy as described by McKittrick should be done.

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ROUTINE USE OF OPERATIVE CHOLANGIOGRAPHY

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THE need for additional diagnostic methods to improve the results in gall-bladder surgery has long been acknowledged. In 1936, Lahey concluded that previous to 1926 he had left a stone in the common duct in one out of every ten patients subjected to a cholecystectomy. In an effort to decrease this high incidence, Lahey increased common duct explorations to 44 per cent in a series of 2,000 cases with the discovery of calculi in 18 per cent of the last one third of this series (8). In view of the increased mortality and morbidity associated with choledochostomy, it is easy to understand the reluctance of most surgeons to explore the common duct unnecessarily. Secondary operations are sufficiently formidable, however, to justify considerable effort to prevent them.

The possibility that careful study of diagnostic methods other than operative ones might improve results led Mirizzi, Best, Hicken, and others to the use of immediate or operative cholangiography (2, 6, 7, 11, 13, 14). In spite of the variety of contrast media and varying surgical and roentgenographic techniques used, their results, nevertheless, showed the value of this procedure. Although these results were reported by Mirizzi in 1931 and by Best and Hicken in 1936, operative cholangiography has not been generally adopted due chiefly to prolongation of operating time and difficulty in the interpretation of technically inferior films (20).

The purpose of this paper is to report our results with the routine use of operative cholangiography on all patients requiring gall-bladder or common duct surgery during the past year, 1946-1947. An attempt has been made to eliminate the causes for poor films and delay. The technique to be described has been functioning to the satisfaction of the surgeon and the radiologist. It must be emphasized that not only interest but absolute co-operation must be maintained during the procedure. The slightest miscalculation on the part of any one of the team will nullify the entire examination or necessitate its repetition.

From the Surgical and Radiological Services, Crile V.A. Hospital and Western Reserve Medical School, Cleveland, Ohio. Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the authors.

TECHNIQUE

The technique of operative cholangiography is simple, and excellent films can be obtained routinely with attention to a few details. The procedure does not prolong the operation more than 5 to 10 minutes. The only special equipment necessary, a plywood tunnel, can be fabricated quickly in any hospital utility shop.

The patient is placed on the operating table with a plywood tunnel beneath his abdomen and lower thorax without an intervening mattress. A pad of the same thickness as the tunnel covers the rest of the table. The tunnel should be large enough to permit easy passage of a cassette carrying a 14 by 17 inch x-ray film and a grid. A 10 by 12 inch cassette and grid can be used just as effectively, but requires more accurate centering. Use of the tunnel precludes the use of a gall-bladder rest, though this may be compensated for partially by means of folded towels. Drapes and wound towels are sewed in place to avoid the presence of metal towel clips in the roentgenogram.

The choice of incision is governed by the width of the costal angle. Paracostal or transverse incision allows the catheter containing the radiopaque substance to be brought in from the side without obscuring any of the underlying duct system. Following the opening of the abdomen, this biliary duct system is carefully inspected, and the cystic duct at its junction with the common duct is dissected. A tie is placed on the cystic duct close to the gall-bladder to prevent injection of radiopaque material into the gall bladder. If the gall bladder is filled with dye, it produces a dense shadow which may often overlie the sphincter of Oddi or some other part of the choledochus.

Many media have been used for visualization of the biliary duct system including lipiodol, thorotrast, hippuran, 35 per cent and 70 per cent diodrast (3, 12, 17). In the present study, 70 per cent diodrast has given the best results. Lipiodol is difficult to inject through a small needle; and, because of its failure to mix readily with bile, it gives a higher percentage of false positives. Due to its greater density, small stones may also be more readily obscured by it. The diodrast should be warmed to body temperature before injection. Previous instillation of a drop of it into the conjunctival sac is employed in an attempt to avoid the infrequent reactions from this material. A quarter inch 22 gauge needle is inserted into the common bile duct. A small caliber needle of this sort is preferred to minimize leakage of bile after it is withdrawn. This needle is connected to a 30 cubic centimeter syringe by means of a foot or more of amber rubber tubing. It is preferable to have the syringe and tubing filled with saline to avoid the introduction of air bubbles and to allow the location of the needle to be checked by the injection of a few cubic centimeters of saline inasmuch as it is often difficult to aspirate bile through this small needle. After it is certain that the needle communicates with the lumen of the common duct, a syringe containing 70 per cent diodrast is substituted for the saline syringe. Twenty cubic centimeters of this opaque material are injected slowly to prevent sudden dilatation of the biliary tree. This procedure generally requires 1 to 2 minutes.

Toward the end of the injection, the surgeon announces its progress in cubic centimeters. This serves to warn both the anesthetist and x-ray technician of the approaching roentgen exposure. As the injection is completed, the anesthetist takes control and signals to the technician to make the exposure during a period of respiratory arrest.

Recently, following Sosman's suggestion, a fractionated method of injection has been tried (16, 19). In the present series, this has consisted of three injections of 5, 5, and 10 cubic centimeters with films being taken after each injection. This should obviate the possibility of small stones in the common duct being obscured by the large quantity of contrast media in a distended duct. Experience with this technique, small amounts of dye being used, has shown better visualization of the anatomy of the common duct, especially in the region of the sphincter of Oddi.

The anesthetic used in this series was intratracheal nitrous oxide, oxygen, and ether. This has the advantage of permitting the patient to be held in respiratory arrest for the 1 to 2 seconds required in making a roentgen exposure. Respiratory arrest is accomplished by having the anesthetist wash out sufficient carbon dioxide in the 5 minute period prior to the injection of the diodrast. Curare has not been used in this series as a means of stopping breathing. Spinal anesthesia was not used because of relaxation of the sphincter of Oddi with resultant poorer visualization of the biliary system (5).

Roentgenograms are taken by means of any standard portable shockproof unit, operating at 90 kilovolts, 30 milliamperes, and an exposure of 1 to 2 seconds. For better detail, a Lysholm grid is attached to the cassette. Motion is eliminated by synchronizing the exposure with the period of respiratory arrest. The cassette is then removed from the tunnel for processing of the film. During the time necessary for this the gall bladder is excised, unless unavoidable indications for exploration of the common duct require this to be done first. Wet films are available for inspection and interpretation before the completion of either procedure. If common duct exploration is necessary, a repeat cholangiogram is taken through the T-tube before the abdomen is closed. The second set of wet films is usually ready for interpretation before the abdominal closure is completed. Any further exploration may be accomplished at the comparatively simple cost of removing a few sutures.

RESULTS

Routine operative cholangiograms were done in 30 cases during the past year, 1946-1947. An analysis of the results revealed that the procedure should be judged, not only as to the technical adequacy of each individual examination, but also as to the amount of information which could be furnished the surgeon under optimal conditions.

Technical results were found to be directly dependent upon the team's experience with the procedure. The team consisted of a surgeon, radiologist, anesthetist, and technician. A number of different teams took part in the present study so that the results could not be expected to be as good as if one team had done the entire group.

Of the group of 30 cholangiograms, 17 cases (56%) were excellent, 10 cases (33%) were diagnostically adequate, but had technical shortcomings, and 3 cases (10%) were failures. To account for the failures, in one instance the needle slipped out of the common duct, and the diodrast was deposited as an indiscriminate mass in this region. In the second, due to uncertainty that the needle was in the common duct, it was withdrawn and re-inserted. Diodrast leaked from the hole in the common duct at the site of the initial puncture and obscured the detail. The third case was a false positive in which two spherical negative densities were visualized near the junction of the cystic and common ducts. Subsequent common duct exploration and T-tube cholangiogram showed no calculus. The artefact was attributed to air bubbles. Increasing familiarity with the procedure and the difficulties involved has greatly raised the percentage of diagnostic films during the past few months. Of the last 15 cholangiograms, 12 (80%) were excellent, 2 (13.3%) were diagnostically adequate, and 1 (6.7%) was a failure (Fig. 1).[1]

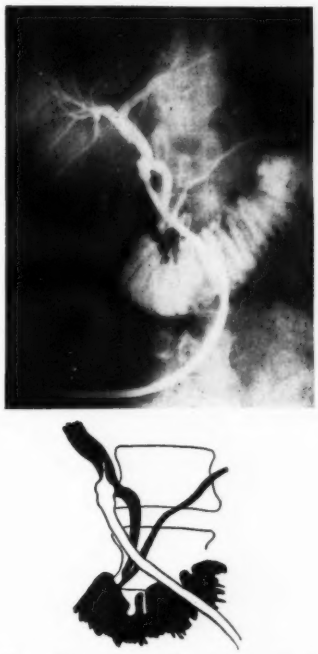


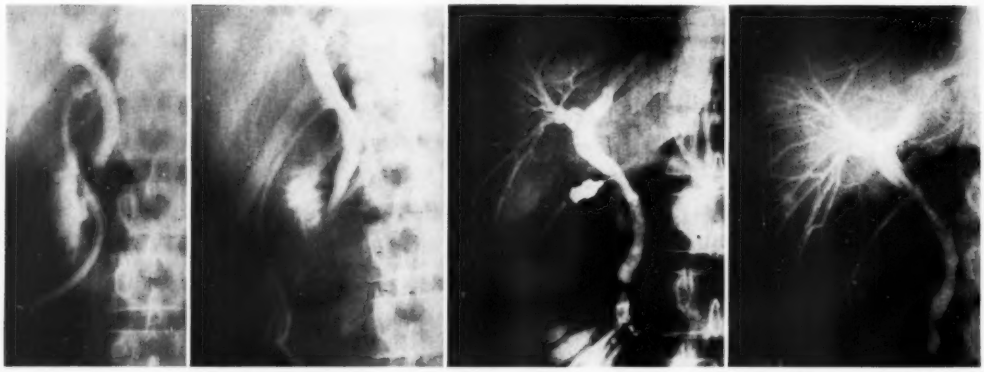
Fig. 1. Normal operative cholangiogram—catheter overlying part of the common duct. Pancreatic duct well visualized.

Although the objective of operative cholangiograms as first used was the determination of the presence of common duct calculi, they have proved a diagnostic aid in other lesions involving the biliary duct system, such as tumors of the head of the pancreas, common duct or liver; inflammation or spasm of the sphincter of Oddi; indirectly, pancreatitis or hepatitis. The true anatomical picture of the extrahepatic and intrahepatic systems is well visualized (1, 17). Following are representative cases of both calculous and noncalculous lesions selected from the present series in which the diagnosis and subsequent decisions were made during surgery on the basis of routine operative cholangiograms.

There are many cases in which the decision to do a choledochostomy is not difficult. A history of jaundice together with the presence of small stones in the gall bladder, a dilated cystic and a dilated common duct do not permit any other decision. Even in these clear cut cases, however, it has proved to be a definite advantage to know the number and location of the common duct calculi before opening the duct (Fig. 2, a, b, c, d).

There are many other cases in which the decision to do a choledochostomy is not clear cut. It is in these cases that operative cholangiography plays an important rôle. Many of them would not be explored, especially if obesity or a borderline cardiac status were an added factor. It is this group that probably

[1]Since this paper was presented for publication, an additional 30 patients have received routine operative cholangiography. There has been a marked improvement in the technical excellence of the films due largely to the adoption of the routine of 3 serial cholangiograms with 5 cubic centimeters of the contrast media injected each time. Eighty per cent of the films were excellent, 10 per cent diagnostic, and 10 per cent failures. It is of interest that the failures occurred with new residents not entirely familiar with the procedure.



a b c d

Fig. 2. a, A 26 year old white male with a 3 year history of severe upper abdominal colicky pain requiring morphine for relief and associated with yellow sclerae on one occasion. X-ray showed a functioning gall bladder with multiple calculi. Operative cholangiogram showing filling defect at lower end of common duct. b, Operative cholangiogram through T-tube after removal of a calculus from the common duct. Duct clear—beginning of pancreatic duct visualized. c, A 29 year old white male with a 3 year history of postprandial epigastric distress activated by greasy food. No history of jaundice. The gall bladder failed to visualize by x-ray on repeated examination. Operative cholangiogram showing 3 negative opacities in the common duct. Notice reflux into pancreatic duct. d, Operative cholangiogram through T-tube after removal of 3 calculi from duct. Duct clear. Spasm of sphincter of Oddi.

contributes the largest proportion of the 10 per cent of common duct stones which Lahey estimated were overlooked at operation. Routine use of operative cholangiography should greatly reduce this figure. It should also prevent the surgeon from exploring a certain number of ducts which appear dilated but contain no calculi. The ability to avoid a common duct exploration in the bad risk patient with confidence that the duct is not involved is certainly worth while.

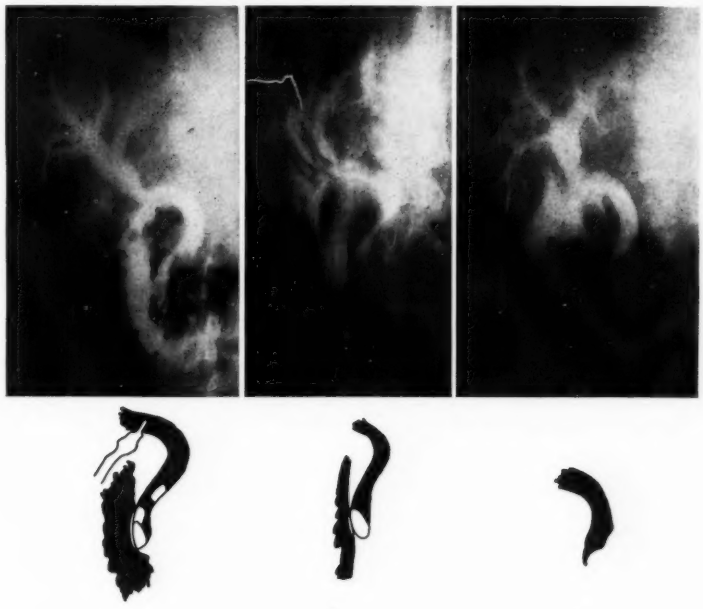
CASE 1. A 51 year old white male was admitted to the hospital with a complaint of indigestion and intolerance to fatty foods which produced nausea and epigastric distress. Past history revealed two attacks of transient jaundice associated with indigestion, nausea, vomiting, and pain in the epigastrium. The pain had not been severe enough to require morphine. The patient had been hospitalized 2 years prior to admission for coronary thrombosis.

Physical examination was essentially normal. Roentgen examination revealed a poorly visualized gall bladder containing calculi. Icteric index was normal. Electrocardiograph was consistent with an old coronary thrombosis.

Surgery revealed a thickened gall bladder containing large and small calculi, the largest, 3 by 2 centimeters. The cystic duct was small, common duct of average size. Operative cholangiogram showed a common duct which was not distended and contained no calculi. The gall bladder was removed. Subsequent follow-up 2 months later revealed no indigestion or complaints referable to the gastrointestinal tract.

A patient with evidence of coronary sclerosis is obviously not a good risk for unnecessary exploration of the common duct.

Of equal importance, in order to prevent overlooking calculi at the time of exploration,



a b c

Fig. 3. a, A 35 year old white female with an 18 month history of indigestion and epigastric pain without jaundice. A poorly functioning gall bladder was visualized by x-ray. Operative cholangiogram showing several negative densities in the common duct. b, Operative cholangiogram through T-tube after removal of 3 calculi from common duct and passage of a No. 12 French woven catheter into duodenum. Negative density still present in region of ampulla. c, Operative cholangiogram through T-tube after removal of a fourth calculus from common duct. Duct clear. Some spasm of sphincter.

is the repeat cholangiogram taken through the T-tube before the abdomen is closed. In 1 case in which exploration, irrigation, and passage of a No. 12 French woven catheter into the duodenum disclosed no further calculi, repeat cholangiogram showed a stone still present in the ampulla. The partially closed abdomen was reopened and the stone removed with some difficulty by means of a scoop. The final film showed spasm of the sphincter of Oddi due to operative manipulation but no additional calculi (Fig. 3 a, b, c).

Exploration of the common duct at the time of the removal of an acutely inflamed gall bladder is a difficult and hazardous procedure. The edematous indurated fat surrounding the duct bleeds easily and increases the danger of inadvertent trauma. A history of moderate jaundice which has subsided, or the residual presence of slight jaundice make accurate information about the common duct essential. This may be obtained after the gall bladder has been dissected from fundus to duct. A small needle is inserted into the cystic or common duct and a cholangiogram is taken. Due to some difficulty in being certain of the position of the needle in the lumen of the cystic duct, a small cannula has been used recently with good results. A roentgenogram showing a common duct without calculi or dilatation and with dye in the duodenum adds greatly to the surgeon's peace of mind and avoids a difficult and extensive procedure.

CASE 2. A 27 year old white male was admitted to the hospital with a 9 year history of recurrent attacks of right upper quadrant pain associated with vomiting. He had been jaundiced on two occasions for several days. Two days prior to admission to the hospital he again commenced to have severe right upper quadrant pain, nausea, and vomiting similar to his previous attacks.

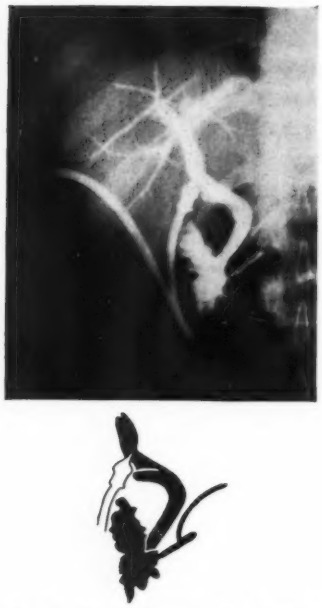


Fig. 4. Case 2. Cholangiogram taken during operation for acute cholecystitis in a patient with past history of jaundice. Common duct without calculus, cystic duct stump, and pancreatic duct are visualized.

Past history revealed typhoid at the age of 13. The patient appeared moderately acutely ill. There was increased resistance in the right upper quadrant of the abdomen with marked tenderness and rebound tenderness referred to this area.

Laboratory examination revealed white blood cells, 19,100, 80 per cent polymorphonuclear leucocytes; urine normal.

Scout film of the abdomen was negative.

At operation an acutely inflamed adherent gall bladder containing two large calculi was removed from fundus to duct. Operative cholangiogram showed a normal common duct without calculus (Fig. 4). Convalescence was uneventful.

Occasionally in spite of adequate exposure, the anatomy of the common and hepatic ducts is not clear, especially at secondary operations. When this is true, it is most helpful to be able to clarify the anatomy by means of a cholangiogram with the dye injected into the first duct containing bile that is encountered. The resulting picture may eliminate much fruitless searching and prevent injury to the duct system as well as visualizing the pathology present.

a b

Fig. 5. Case 3. a, Operative cholangiogram through catheter showing short segment of common duct with constant angulation and narrowing but without calculi. b, Operative cholangiogram showing proximal portion of duct system and intrahepatic branching of hepatic ducts.

Case 3. The patient was a 31 year old white male with a 12 year history of recurring episodes of painless jaundice lasting about a week at a time and coming on several times a year. With his entry into the Army in 1941, the attacks became monthly and were associated with diarrhea. A more severe attack of jaundice overseas in 1944, 2 years prior to admission, was diagnosed "infectious hepatitis" and he was returned to this country. Following a severe attack of abdominal pain radiating to the back, cholecystectomy was performed 6 months later in an Army hospital. The gall bladder was said to have contained stones. Mild intermittent jaundice continued, and he received a disability discharge. For the last 6 months prior to admission, the patient had been jaundiced constantly and had had discomfort in his operative scar.

Family history revealed a brother who had had several months of common duct drainage following exploration of the duct for calculi.

Admission physical examination showed mild icterus and slight abdominal tenderness below the xiphoid.

Laboratory examination revealed an icteric index of 25, normal liver function, normal fragility test, and negative duodenal drainage.

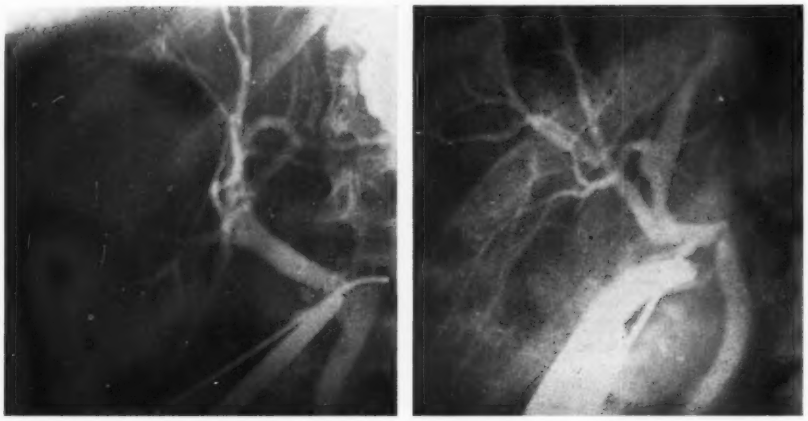
a b c

Fig. 6. a, A 42 year old colored male with a 3 week history of fatigue and aching abdominal pain and a 3 day history of jaundice. The gall bladder failed to visualize by x-ray, and the laboratory findings suggested obstructive jaundice. Operative cholangiogram showing dilated biliary duct system with a complete block in the region of the ampulla. b, Opened operative specimen showing carcinoma of ampulla blocking the common duct. c, A 55 year old white male with a 2 month history of itching of the skin and a 6 week history of epigastric pain and jaundice. X-ray examination of the gastrointestinal tract showed extrinsic pressure on the duodenal cap. Laboratory studies suggested obstructive jaundice. Operative cholangiogram through a cannula in the cystic duct showing the cystic and hepatic ducts narrowed and the duct system dilated proximal to a complete obstruction. This was found to be due to carcinoma of the common duct involving both hepatic ducts and the cystic duct.

Operation was performed for probable common duct stone. The distance between the portal fissure and the duodenum was not over 3 centimeters. The common duct appeared to be 2 centimeters in diameter but had a lumen which was difficult to find and which admitted a No. 10 French catheter snugly. Operative cholangiogram through this catheter identified the lower end of the common duct with no calculi present and dye in the duodenum (Fig. 5a). A constant narrowing and angulation of the duct in the region of the sphincter was diagnosed as probable inflammation of the sphincter of Oddi with spasm. A catheter inserted in the opposite direction visualized the intrahepatic portion of the duct system (Fig. 5b). T-tube drainage was instituted. The patient continued to have an icteric index up to 33 and had episodes of mild jaundice. He remained afebrile and asymptomatic with the T-tube still in place after 5 months. Forty centimeters of water pressure through the T-tube produced discomfort and 50 centimeters caused definite pain. Nitroglycerine and atropine had no effect on the duct pressure. The T-tube had been clamped for the month prior to his last follow-up without a return of jaundice or pain.

Operative cholangiography was of great value in this case in proving that the small duct obscured by a greatly thickened wall was really the common duct. Without it, identification of the proximal portion of the biliary tract would have been more difficult.

Operative cholangiography has also proved useful in the diagnosis of tumors of the bile ducts and head of the pancreas. Dye injected into the dilated portion of the duct system shows the nature and completeness of the block without dissection in the region of the



a b

Fig. 7. a, Right hepatic duct displaced to the left by tumor in right lobe of liver. Left hepatic duct is not involved. b, Normal, right and left hepatic ducts and tributaries. Reprinted through courtesy of Dr. Paul Rudström (*Acta Radiologica*).

tumor. Where doubt still remains at surgery as to whether or not a tumor exists in the ampulla or head of the pancreas surrounding it, it is much simpler to take a cholangiogram than to open the duodenum and explore the region (Fig. 6 a, b, c).

CASE 4. A 26 year old white male was admitted to the hospital with a two year history of dull aching epigastric pain. The pain occurred after eating, was sometimes colicky, and did not radiate. Six months prior to admission he had noticed anorexia and had lost a total of 50 pounds up to the time of admission. Six weeks before admission he became icteric. This cleared somewhat on bed rest and a fat free diet and then recurred. Past history was noncontributory except for a period of moderately severe alcoholism following discharge from the Navy.

Physical examination showed a well developed, deeply icteric white male who had obviously lost considerable weight. There was direct and rebound tenderness in the upper abdomen. The liver and spleen were not felt.

The icteric index varied from 110 to 190, cephalin flocculation test, 4+, 40 per cent retention of bromsulfalein in 30 minutes, normal fragility test. Serum amylase rose to 196. X-ray examination of the upper intestinal tract revealed a normal esophagus, stomach, and duodenum. Cholecystograms were not taken because of the icterus. The patient's upper abdominal tenderness increased and localized in the right upper quadrant, and his temperature commenced to swing up to 100 degrees daily.

Exploration was performed with a diagnosis of acute and chronic cholecystitis with common duct stone. At operation, the gall bladder was quite distended, would not empty, but contained no calculi. No calculus was felt in the common duct. The head of the pancreas was quite firm, and a diagnosis of carcinoma was considered. A cholangiogram was taken with a needle in the lumen of the common duct. This showed a common duct of normal appearance with dye entering the duodenum readily. Biopsy specimens were taken from the pancreas and liver which were later reported as normal pancreas and acute inflammation of the portal areas of the liver. The patient had an uneventful convalescence and regained his appetite. The icteric index dropped to 25 and the bromsulfalein test returned to normal. He was discharged on the 19th postoperative day, feeling well.

DISCUSSION

The success of routine operative cholangiography is directly dependent upon the ability to produce a cholangiogram of good diagnostic quality with a negligible loss of time. The closest co-operation of the surgeon, radiologist, anesthetist, and x-ray technician is essential. Passive indifference on the part of the surgeon or radiologist toward the perfection of operative cholangiography only negates the procedure. Even the slightest respiratory motion during the course of exposure due to lack of co-ordination by either the anesthetist or the technician can entirely destroy the value of the examination.

Due to the various components involved, although operative cholangiography is not

difficult, it seemed wiser to follow Mirizzi's example and attain maximum proficiency by making the procedure routine. This had the added value of thoroughness in an effort to prevent overlooking biliary tract disease. Russell Best is of the opinion that cholangiograms are as essential to the surgeon doing gallbladder surgery as a gastrointestinal series is before considering a gastric resection (2).

Interpretation of cholangiograms is not difficult provided one bears in mind the various artefacts that may occur and how to avoid them. Common causes for misinterpretation are the presence of air bubbles in the common or hepatic ducts; the inadvertent placement of the tubing carrying the opaque material too far medially so that it overlies and obscures the extrahepatic biliary system; and failure to insure proper placement of the needle in the lumen of the common duct which causes dye to pool in the vicinity. The injection of dye must not be too rapid or the biliary tree will overdistend, again giving false evidence of pathology. All of these mishaps can usually be remedied by repeating the cholangiogram as soon as the wet films are inspected. The needle hole in the common duct has generally ceased leaking and can be disregarded. The additional time loss is not great.

Most common duct calculi are non-opaque. If precautions have been taken to exclude air from the system, negative shadows in the intrahepatic or extrahepatic systems are indicative of calculi. Although it is possible that negative shadows might be due to blood clot or intraductal tumor, these have not been present in our experience. However, false negative shadows caused by borders of vertebrae and gas in the intestine may be encountered. Deviation or deflections of either hepatic duct or the main branches may be due to space occupying lesions. Rudström described 2 cases of intrahepatic disease which were diagnosed by means of operative cholangiography. In one instance a tumor of the right lobe of the liver was demonstrated, displacing the right hepatic duct (Fig. 7, a and b). Marked distention of the hepatic radicles is indicative of a mechanical block. Tumors of the ampulla of Vater or head of the pancreas are funnel-shaped or irregular. Spasm of the sphincter of Oddi may be encountered if dye is injected too rapidly.

In the past, the objections to operative cholangiography have been: poor films, insufficient information obtained, and too much time consumed in the examination. Attention to the aforementioned details, perfection of technique, and consequent improvement of interpretive diagnosis should largely dispose of these objections.

SUMMARY

1. The results of a year's experience with the routine use of operative cholangiography have been presented.

2. A simplified technique using readily available equipment is described.

3. The types of cases in which operative cholangiography has proved useful are discussed.

4. Reasons for technical failures and false positive diagnoses are mentioned with suggestions for their correction.

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ATRAUMATIC LOW THIGH AMPUTATION

Further Modification of and Experiences with Technique

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SINCE 1936 the writer has been especially impressed with low thigh amputation performed according to the basic principles advanced by Callander (3,4) in 1935 in which no muscle bellies are cut. The operation was originally devised to lessen shock and to prevent the proximal spread of infection. Attention was directed to the following anatomical facts: (1) The popliteal space is a closed space, the intact upper limit of which acts as an effective barrier to the spread of infection; (2) section only of tendon preserves this bulwark against infection, whereas section of the fleshy portions of muscles destroys it; (3) the tissues of the lower thigh, knee, and upper leg are supplied by the deep femoral artery which is rarely affected by occlusive arterial disease even in patients in whom the superficial femoral artery is completely occluded.

In the Callander technique long viable skin flaps are fashioned from the upper leg; all transections of muscles are done through their tendinous insertions; the bone is sectioned through the flares of the condyles; the patella is excised and its bed made available as a cover for the bone end; the skin and subcutaneous tissues are approximated loosely. As the hamstrings draw the posterior flap cephalad, the patella bed is directed over the bone, and the skin flaps retract to fit snugly about the bone. The technical and anatomical points in this procedure lend themselves very favorably to amputation for peripheral vascular disease and the author continued to use this technique in the first fifteen amputations for peripheral vascular disease done according to the Callander principle. Because of a somewhat high percentage of delayed healing, persistent edema of the stump, and mobility of the patella bed which interfered with the function of the prosthesis, the writer modified the procedure, and in 1941 he reported details of his new technique (17) which in general consisted of the following changes: (1) The skin flaps were of the "fish mouth" type and of similar length and contour; (2) the patella and the peripatellar tissues were completely removed; (3) the bone was not sectioned through the condyle flares but through the medullary portion of the femur 2.5 to 9 centimeters above the epicondyles.

The author's modification produced a definite improvement in the tendency to heal per primam, in the contour of the stump, and in the fitting and functioning of the prosthesis. It was usual, however, for an appreciable amount of clear or slightly bloody fluid to form in the stump and be discharged for 3 to 5 days through the openings left at the apex of the suture line. Often there was enough fluid to soak the dressings. In some cases the formation of fluid continued after the suture line healed, requiring its evacuation. In a goodly number of cases, evidence of fluid accumulation in the stump persisted for many weeks, even months, causing edema in the region of the suprapatellar bursa which delayed the shrinking process and interfered with the satisfactory use of the prosthesis.

In the author's modification, as well as in the original technique, the suprapatellar bursa remains intact, and a considerable portion of the synovial membrane of the bursa is left in the stump. This membrane may well continue to secrete synovia and be responsible for the discharge of fluid which often occurs. In an attempt to eradicate this factor, the author has further modified the procedure, removing the synovial membrane in accordance with the technique described and illustrated below.

TECHNIQUE

The operation proceeds as usual with the formation of skin flaps, tenotomy of the medial hamstrings, opening of the popliteal space, section of the vessels and nerve, tenotomy of

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the biceps femoris and tensor fascia femoris, scalping back the anterior flap, mobilization of the posterior flap, entering the knee joint through the tendon of the quadriceps femoris, and section of the retinacula genu. These steps are described in detail and illustrated in a previous article by the author (17). The anterior flap is drawn sharply cephalad, exposing by inversion the depths of the suprapatellar bursa, and the additional step is carried out as follows (Fig. 1):

The edges of the synovial membrane are grasped with forceps and the membrane gently separated from the underlying structures. The dissection is begun medially, first freeing the membrane from the underlying muscle fibers of the vastus medialis, then laterally from the tendinous fibers of the vastus lateralis, as the dissection is carried toward the midline. The membrane is loosely attached to these structures by the interposition of a well defined layer of areolar tissue of definite thickness and separates easily. When the undersurface of the quadriceps tendon is reached, however, the membrane becomes thin and intimately attached to the tendon, so that a clean-cut separation is made impossible. The membrane is freed as much as possible and the undersurface of the quadriceps tendon is scraped clean of the remainder with a curette. If desired, a thin shaving of the tendon may be removed with the synovial membrane in order to eliminate the membrane completely, but the tendon is extremely tough and a clean removal of a slice is difficult. As the membrane, previously freed on each side, now medially, is mobilized it is gradually reflected caudad off the vasti, the retinacula, the tendon of the quadriceps femoris, and the anterior surface of the femur to a point caudad to the proposed site of bone section (Fig. 1). The separation from the femur is also easily accomplished because of the interposition of loose areolar tissue. Thus the entire secreting membrane forming the suprapatellar bursa is removed with the specimen. The section of the bone and the closure are carried out as previously described (17).

In 1943, Pearl and Misrak (19) reported their experience with the atraumatic amputation through the lower thigh, a technique which

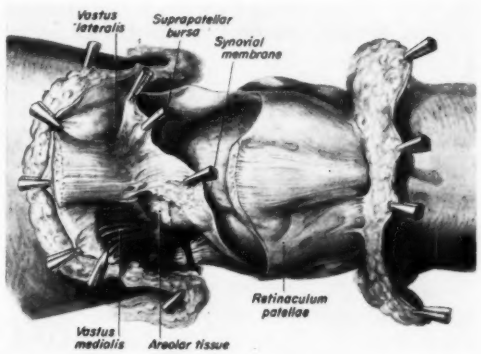

Fig. 1. The suprapatellar bursa has been entered through the tendon of the quadriceps femoris and the retinacula sectioned. The anterior flap has been drawn sharply cephalad, and the depths of the suprapatellar bursa have been exposed by inversion. Hemostats grasp the edges of the synovial membrane which forms the bursa. The synovial membrane has been freed from the vasti laterally and partially from the undersurface of the quadriceps tendon medially. It will be dissected caudad to a point distal to the proposed bone section, indicated by the broken line, and will be removed with the specimen.

cuts no muscle bellies. Several additional points which are the result of further experience with this method of procedure are worthy of mention.

Skin flaps. In fashioning the posterior skin flaps the knee should be held in about 15 degrees' flexion. If the flap is marked out with the knee in full extension it will be too short. In legs with a goodly amount of subcutaneous fat the flaps should be about equal in length; in thin muscular legs the posterior flap should be made about 1 to 1½ centimeters longer because of a greater tendency to retract. In making the curve for the posterior flap, the stump contour will be improved if care is taken to eliminate the "dog ears" by avoiding a sweep which is too circular.

Treatment of sciatic nerve. The sciatic nerve was formerly injected with absolute alcohol to prevent neuroma formation. There is no apparent difference in postoperative pain or phantom limb sensation when the alcohol is omitted. The nerve is gently drawn down, always ligated firmly as high as possible with fairly strong material in order to control the bleeding from the cut end, and sectioned about 2 centimeters distal to the ligature with knife

or razor blade—never with scissors. The ligature is left long so that the end may be inspected just before closure is made as bleeding from the arteria comitans is a common cause of hematoma and delayed healing. It is not unusual for the nerve to require a second ligature.

Sawing the bone. The Gigli wire saw is, in the author's hands, the most efficient and atraumatic instrument with which to section the bone. Some difficulty may be encountered in holding to the perpendicular in both planes, and he has often asked an observer to check the alignment as the section progressed. The assistant should support the bone in its original alignment until the bone has been completely divided in order to prevent fracture during the last portion of the section. The periosteum is allowed to reach the bone end; no cuff is removed. Bleeding from the bone is another frequent cause of hematoma in the stump and should be thoroughly controlled before closure. More recently a thin piece of absorbable oxidized cellulose, cut to fit and applied to the bone end, has been used for hemostasis. The author prefers it to bone wax.

Special care of biceps tendon. If the bone section is high or the biceps long, the latter may tend to prolapse from the wound through the spaces left for drainage (see closure). To avoid this, the cut end of the biceps is anchored to the tissue about the bone with a suture.

Irrigation of the wound The use of saline irrigations removes bone dust, clots, and loose fat, and tends to promote per primam healing. It also demonstrates oozing points which may require attention.

Control of bleeding. This is very important before closure. Every bleeding point should be meticulously controlled with ligature or coagulation. The time spent in this step may be long and the task tedious, but the operator will be rewarded by an increased percentage of clean, trouble-free wounds which heal per primam. An extra half hour, grudgingly devoted to this chore, when required, is a small price, indeed, when compared to the weeks and often months of painful, time-consuming dressings which healing by secondary intention often entails.

Closure. In our early cases, closure was effected with interrupted silk which passed through skin and subcutaneous tissues, every other stitch being left untied to allow for drainage, loose sutures being drawn tight on the third or fourth day. It was soon found, however, that drainage passed through the openings left at the apex only, and that it was unnecessary to leave openings for drainage in the lateral arms of the incision. Before any sutures are placed, the fit of the flaps is checked with towel clips, and excess skin, if present, is excised. It is rarely necessary to alter the skin flaps if they are carefully planned. Beginning at the most proximal portions of the lateral arms, the approximation sutures of No. 1 Deknatel silk are then passed through skin and subcutaneous tissues until the region of the apex is reached. In this area, the sutures are placed as usual, but every other stitch is left loose and knotted at the ends for a distance of about 3 centimeters on each side of the midline. This procedure allows any retained blood or fluid to escape during the first few days. As soon as the drainage stops, the remaining sutures are tied. Drainage material is never used.

Dressing. A well executed operation may be spoiled by an unsatisfactory dressing. Additional pressure pads are placed so as to obliterate the "hamstring pouch" posteriorly. The remainder of the stump is enclosed in cotton abdominal pads held in place with a snugly fitting gauze bandage. Over this, bias-cut stockinette is applied so as to give firm and even pressure to the entire stump. The pressure should be firm enough to eliminate dead space and control capillary bleeding, but not enough to interfere with the circulation of the tissues. The actual application of the proper pressure is a matter of experience. In applying the bandages, rotation of the soft tissues of the stump should be guarded against. Splints interfere with the retraction of the posterior flap and with the movement of the stump and are therefore not used.

Postoperative care. As soon as the anesthesia has worn off the patient is encouraged to move the stump. The stump rests horizontally on the bed and is not raised on a pillow for fear of causing flexion contractures. He is

encouraged to walk with crutches as soon as possible; usually on the first or second day. The stitches in the lateral arms of the wound may be removed on the fifth day, but those at the apex should be left until the twelfth or fourteenth day. The hamstring pull is sometimes strong enough to cause strain on the suture line at the apex, and the additional support afforded by the sutures is advisable until the union of the skin and subcutaneous tissues is sufficiently firm.

Anesthesia. In almost all of our patients, low thigh amputation has been done under low subarachnoid block. This anesthetic causes little or no disturbance of the blood pressure since only the vasomotors of the lower extremities and the saddle area are affected. The simultaneous paralysis of the vasoconstrictors to the legs allows the fullest possible vasodilatation. Premedication with morphine, scopolamine, and nembutal acts to minimize psychic trauma. The majority of the patients sleep through the procedure. The only possible trauma is psychic due to the noise of the saw since the subarachnoid block isolates the site of operation from any sensory connection with the cerebrum; most of the patients have no memory of the operation itself. The risk of *low* subarachnoid block is so slight and the results so gratifying that it leaves little to be desired.

The author is fully aware of the use of refrigeration as a method of limb anesthesia. The concept was advanced early in the development of refrigeration that tissues thus cooled were merely in a state of suspended animation or hibernation; that all physiological processes came to a standstill; and that the tissues when allowed to return to normal temperatures resumed their functions uninjured and unchanged. The experimental work of Large and Heinbecker (7,8,9), Bruneau and Heinbecker, Brooks and Duncan, however, showed without question that refrigeration causes definite injury to tissues. In most instances of refrigeration anesthesia, a tourniquet is necessary above the site of amputation. The operation is therefore done through tissues which have been subjected to circulatory arrest plus refrigeration—two conditions which diminish the local resistance to infection and retard the healing process. That these complications may occur is attested to by clinical reports of slough of tissues distal to the tourniquet.

When there is a necessity for delay in amputation, either because of some general condition of the patient which makes waiting advisable, or because of spreading infection and toxemia from the affected member, refrigeration is without question a valuable procedure. The author fully agrees with the tenets advanced by writers already quoted which include the following conditions for the use of refrigeration: (1) there must be a necessity for delay in amputation; (2) the tissues to be refrigerated are hopelessly diseased and their removal is mandatory—viable or potentially viable tissues are not refrigerated; (3) the tourniquet is placed immediately proximal to the lesion and is not thereafter disturbed; (4) when amputation is performed the tourniquet is left in place but the operation is done under subarachnoid block or some other form of anesthesia through nonrefrigerated tissues.

The technique of atraumatic low thigh amputation as now performed by the author has been developed over a period of 11 years and has proved itself a highly desirable operation. It is applicable to diseases of the peripheral arteries as well as to any other condition requiring low thigh amputation in which the tissues about the low thigh, knee, and upper leg are not traumatized nor inflamed. It causes little or no shock, has an extremely low mortality, and results in a stump which meets the approval alike of patient, surgeon, and limb maker. The stump is mobile, painless, end bearing, and its conical shape lends itself well to the prosthesis. The shrinking process proceeds rapidly. Phantom limb sensations are present in every patient, but in none have they been a source of unusual annoyance. None of the amputees have had "painful stump syndrome" or symptoms suggesting neuroma formation.

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AN EXPERIMENTAL APPROACH TO THE PROBLEM OF INCREASING THE BLOOD SUPPLY TO THE LUNGS

Preliminary Observations on the Use of Plastics

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A CONSIDERABLE impetus to the study of congenital cardiac defects has resulted from the work of Blalock and his associates. This group has shown that relief of cyanosis and improvement in exercise tolerance may be obtained in a substantial proportion of patients exhibiting the tetralogy of Fallot, by the construction of a vascular shunt from a large systemic artery to one of the pulmonary arteries. The modification proposed by Potts, consisting of an anastomosis between the aorta and a pulmonary artery, is an additional development of the same principle.

An investigation was undertaken in this laboratory of the possibility of employing a more central approach to the problem of increasing the blood supply to the lungs. Attention was focused on the right side of the heart, in an effort to devise a method which would avoid the creation of an artificial arteriovenous communication. Two avenues of approach were explored: (1) circumvention of the pulmonary valve by a shunt from the right ventricle to the proximal portion of the main pulmonary artery; and (2) dilatation of the pulmonary valve ring.

EXPERIMENTAL DATA

1. Intubation of the right ventricle and the pulmonary artery, by-passing pulmonary valve. Polyethylene tubing was selected as the most promising of the available materials. As demonstrated by Ingraham, Alexander, and Matson, polyethylene is a plastic substance characterized by lightness, malleability, flexibility, ease of adjustment, and ease of sterilization. It is chemically inert, and nonirritating to living tissues. When the flow of a sufficient volume of blood is maintained, clotting may be avoided for a considerable period of time. Practical application of this property has been made by Myers in intravenous therapy, and by Diamond and Thomas for replacement transfusions in the treatment of severe erythroblastosis fetalis. Hackworth reported replacement of the thoracic aorta in dogs.

The operations were performed on cats, weighing about 10 pounds, and anesthetized by sodium pentobarbital administered intraperitoneally. Controlled rhythmic inflation of the lungs was maintained by air delivered under positive pressure through an intratracheal tube. The left pleural cavity was entered through a left parasternal incision, with division of the 3rd, 4th, and 5th costal cartilages. The pericardium was incised anterior to the phrenic nerve, and the pericardial flaps held apart by traction sutures (Fig. 1,a). Two vertical parallel hemostatic sutures of fine silk were placed in the anterior wall of the right ventricle, and 2 similar sutures in the anterior wall of the pulmonary artery a short distance above the valve ring (Fig. 1,b). In the later experiments a pursestring suture was also placed between the hemostatic sutures in the pulmonary artery. Two anchoring sutures, previously placed in the wall of the longer arm of the prebent polyethylene tube, were passed horizontally between the hemostatic sutures in the pulmonary artery. An oblique incision was made in the square marked out by the 4 sutures, the end of the tube inserted into the lumen of the pulmonary artery, and the hemostatic sutures tied to each other. The pursestring suture was secured, and each anchoring suture tied (Fig. 1,c). The ventricular end of the tube was inserted by a similar technique (Fig. 1,d). The location of the ends of the tube viewed from within the heart may be

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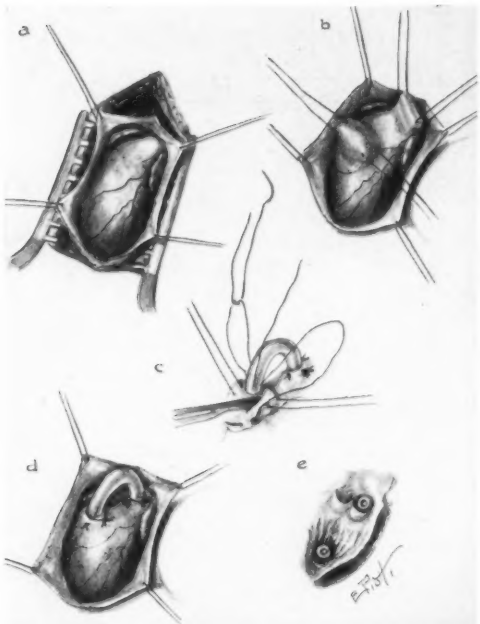

Fig. 1. Circumvention of the pulmonary valve by a polyethylene tube passing from the right ventricle to the pulmonary artery. a, Exposure of the right ventricle and pulmonary artery. The pericardial flaps are held apart by traction sutures. The edge of the left auricle is seen just above the anterior descending coronary artery. b, Two hemostatic sutures have been placed in the right ventricle and the pulmonary artery. c, The pulmonary end of the tube has been inserted; the ventricular end is in position to be placed. Note the 2 anchoring sutures in the wall of the tube. d, Tube circumventing pulmonary valve. e, Postmortem specimen, showing one end of the tube in the lumen of the right ventricle and the other end in the pulmonary artery just above a valve cusp.

seen in Figure 1, e, drawn from the postmortem findings in cat 20. The pericardium was not sutured, and the wound was closed in layers, air being removed from the pleural cavity by suction through a catheter during the closure.

The results obtained in this series of operations were as follows. Of the 11 animals explored, the intubation was completed in 3. Three cats died during attempted implantation of the tube, due to hemorrhage or other technical difficulties. Operation in 5 instances was terminated by suture of the incision in the pulmonary artery, following failure properly to insert the tube. At postmortem examination, performed subsequently in the course of other experiments, there was no evidence of narrowing of the lumen of the pulmonary artery or of thrombus formation at site of sutures.

The 3 cats in whom circumvention of the pulmonary valve was completed provided material for subsequent observations. One animal died 12 hours postoperatively, and the other 2 were sacrificed on the 36th and 47th postoperative days respectively. In no instance was there noted any displacement of the ends of the tubes from their location at the time of operation. In every case the lumen of the tube was occupied by a partially organized adherent thrombus, so that it was not possible to estimate how long the flow of blood through the tube, observed at operation, had been maintained. The reaction around the outer walls of the tubes consisted for the most part of a thin fibrous membrane.

2. *Dilatation of the pulmonary valve.* The need for a light, nonirritating prosthesis which could be inserted into the pulmonary valve ring and left *in situ* was met by the use of lucite. Intubation of the aorta of dogs with lucite tubes was reported by Hufnagel, who found no thrombosis after several months of observation; in our experience, freedom from clot has been dependent on a highly polished, absolutely smooth inner surface.

The final shape of the lucite tubes employed for dilatation of the pulmonary valve is seen in Figure 2. The tube is slightly tapered, and the leading edge bears 2 shallow circular grooves on its outer surface for greater purchase. A flange 1 millimeter in width around the following end of the tube was designed to impede expulsion of the tube through the valve ring. The technical problem of controlling the position of the tube during its insertion through an incision in the anterior wall of the right ventricle was overcome by modifying an ordinary dura clip forceps so that the ends were splayed slightly outward. A lucite tube, fitted over the tips of such an instrument, may be held snugly, without slipping off or sliding back on handles of forceps.

The surgical approach to the right ventricle was the same as that employed in the previous experiments, and the same exposure was obtained. Two parallel rows of hemostatic sutures were placed in the anterior wall of the

right ventricle; each row consisted of 3 sutures (Fig. 2,a). An incision was made through the wall of the right ventricle between the rows of sutures, and the end of the inserter armed with the lucite prosthesis was introduced to the region of the pulmonary valve. The inserter was disengaged and withdrawn; hemostasis was effected by tying the parallel sutures (Fig. 2,b). The location of the prosthesis was confirmed by palpation, and the pericardial flaps were loosely approximated, leaving room for drainage into the right pleural cavity. Closure of the chest wall was performed in the manner already described.

This procedure was attempted in 8 animals, with 3 deaths either during operation or within a few hours thereof; these fatalities were ascribed to acute blood loss. In the remaining 5 cats the tube was successfully inserted within the pulmonary valve ring, The survival times ranged from 8 hours to 5 months. In 2 instances there had been no postoperative displacement of the tube; the second cat died on the ninth postoperative day. In 1 animal the tube was found in the lumen of the right ventricle, and had obviously been too large a tube for the particular cat. Autopsy on the 2 remaining animals showed migration of the tube to the bifurcation of the pulmonary artery in one instance, and to the hilus of the right lung in the second case. The lumen of each of the tubes contained a small thrombus, not completely occluding the prosthesis. There was no thrombus formation on the endothelium in contact with the tubes; moderate infiltration of the vessel walls with lymphocytes was seen.

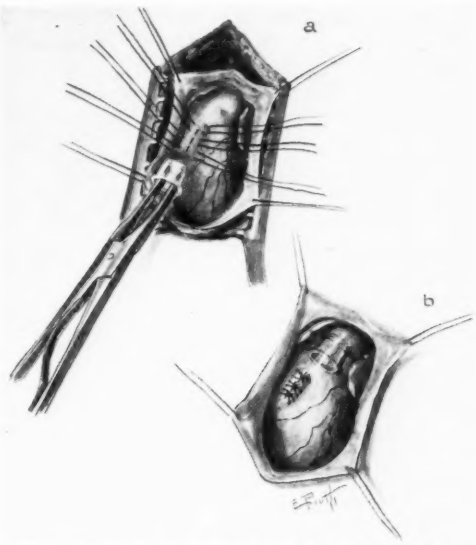

Fig. 2. Insertion of a lucite tube for dilatation of the pulmonary valve. a, Same exposure as in Figure 1. Two parallel rows of hemostatic sutures have been placed in the anterior wall of the right ventricle. The inserter is armed with the lucite tube. The dotted line indicates the proposed site of the myocardial incision, through which the tube will be inserted. b, Showing the lucite tube inserted at the site of the pulmonary valve. The incision in the myocardium has been closed by tying the hemostatic sutures.

DISCUSSION

Jeger has described early unsuccessful attempts at the construction of vascular shunts by-passing cardiac valves. The survival of animals in the present study, following the insertion of a polyethylene tube circumventing the pulmonary valve, provides a basis for an experimental program extending these observations. The occurrence of clotting within the prostheses was not unexpected, as there was no obligatory flow of blood through the tubes. Since the degree of clotting is a function both of the size of the lumen of the tube and of the volume of blood flow, both of these factors could be evaluated further by the use of larger tubes in dogs, and by ligating the pulmonary artery within the by-passed area. By these maneuvers, in addition to survival and nondisplacement of the tube, a shunt might be established that would remain patent and provide a tool for the study of vascular physiology and pathology. A similar technique could be applied to other chambers of the heart.

Survival following dilatation of stenosed valves in humans has been described by Tuffier and by Souttar. In these patients the aortic and mitral valves respectively were dilated by invagination of the vessel wall through the valve lumen, over the finger of the operator. In the present investigation an attempt was made to insert a prosthesis that would maintain the valve in a dilated state. It has proved more difficult to keep such a tube from being dislocated than was the case with the by-pass procedure. However, with further refinements in technique, a greater

degree of success has been obtained. Work is now in progress on the construction of a lucite prosthesis containing a valve, to eliminate free pulmonary insufficiency. The application of the venous catheterization technique to animals in which such prostheses have been inserted might prove of value in the study of altered cardiac physiology and dynamics.

In the course of this study it was considered that a prosthesis either circumventing or dilating a cardiac valve should have a diameter conforming to that of the normal valve. In order to determine the average dimensions of the pulmonary valve in children, the pertinent data from an extensive series of autopsy protocols were subjected to statistical analysis. It was found that the average diameter of the pulmonary valve varies only 1 millimeter between the ages of 2 and 7 years. The optimum diameter for a prosthesis intended to by-pass or dilate the pulmonary valve in children of this age group should be about 14 millimeters.

The assumption has been generally accepted that the lesion responsible for the decreased flow of blood to the lungs in patients with the tetralogy of Fallot would not be amenable to local dilatation. It is well known that many of these individuals succumb within a few months of birth, of a combination of cardiac lesions that is incompatible with survival. An impression was tentatively entertained that, with the elimination of the patients presenting the most serious defects, the surviving children might present a situation more favorable for direct surgical dilatation. An analysis of the autopsy material in this laboratory establishes the fact that such is not the case. There is no single stenotic or atretic lesion responsible for the hypoxemia associated with the tetralogy of Fallot, but rather a combination of defects. Among the unpredictable variables in a given case are the degree of prominence of the crista supraventricularis, the status of the valve ring, the condition of the valve cusps, the size and location of the septal defect, rigidity of the base of the pulmonary artery, and extent and degree of atresia of the pulmonary artery.

While this would seem effectively to preclude any attempt at local dilatation of the pulmonary valve, the circumvention type of procedure still merits consideration. The use of a substance such as polyethylene tubing permits alteration in the ultimate shape of the prosthesis, to conform to a given situation. It is not implied at this time that a technique such as this has been developed sufficiently to justify application in human material. Among other theoretical objections is the feature of a foreign body with a lumen of fixed size in a growing organ. Also, as emphasized by Elliott Cutler, any abrupt change in cardiac dynamics, such as would be caused by this type of procedure, might entail serious side effects. It is, however, suggested that this approach merits further development in the study of the dynamics and therapy of cardiac lesions.

SUMMARY

1. A technique has been described for the insertion of prostheses circumventing and dilating the pulmonary valve.

2. The properties of polyethylene and lucite have been described.

3. It is suggested that this approach may be useful in reproducing the effects of valvular insufficiency, and in the study of the altered physiology and dynamics of cardiac lesions. A tentative program is proposed.

4. The possible application of this method to provide an increased blood supply to the lungs in the face of pulmonary stenosis is discussed.

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CELIAC SYNDROME

VII. Therapy of Meconium Ileus; Report of Eight Cases with a Review of the Literature

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THE association of meconium ileus with pancreatic cystic fibrosis was first described by Landsteiner in 1905. Since then there have been 11 other cases reported (3–5, 8–11, 14–16, 18) in each of which meconium ileus has been noted at operation and fibrocystic disease of the pancreas described following autopsy. Thus the coexistence of these two conditions has been well established. Seven additional cases have been found in the pathological records of the Babies Hospital.

Two hypotheses have been suggested to explain the association of abnormal meconium and fibrocystic disease of the pancreas. The first, advanced by Landsteiner, regards the abnormal meconium as primary and the changes in the pancreas as the result of intestinal obstruction; the second considers the changes in the pancreas as primary and the abnormality of the meconium as the consequence of lack of normal digestion of the meconium by pancreatic secretions. The latter view, which is generally held at present, has been strongly supported by the studies of Farber (6,7).

Farber investigated the altered physical state of meconium in infants with meconium ileus. "The meconium was so sticky and mucilaginous in consistency that the fingers and instruments were not easily extricated from the meconium after contact." The bowel is not able to propel this abnormal material and so the meconium becomes responsible for the intestinal obstruction. In vitro experiments by Farber showed that when this abnormal material was placed in contact with saline solutions of pancreatin (1 to 10% at 37.5 degrees C.) it was quickly reduced to a semiliquid or liquid state. This observation provides the chief evidence for the view that the lack of pancreatic enzymes is the main factor responsible for meconium ileus.

It is obvious from a review of the literature as well as from our own experience that there are all variations and degrees of obstruction due to abnormal meconium in patients with cystic fibrosis of the pancreas. Many such patients have no obstruction at all. Some have transient meconium plugs which are passed following mild obstructive symptoms. Occasionally such a case responds to the instillation of pancreatin into the exposed gut at operation, or to simple massaging of the meconium on into the large intestine. Farber has reported 4 cases in which the obstruction was relieved by the instillation of a 1 per cent pancreatin solution through an enterostomy opening. However, death occurred several days to a few weeks after the instillation from intercurrent infection.

We wish to emphasize that in this paper we are concerned with meconium ileus of the most severe form in which in our judgment it was inconceivable that the obstruction could be relieved by any of the above described conservative measures. The actual pathologic findings and surgical technique will be described in detail.

Hurwitt and Arnheim, in 1942, reviewed the literature and were unable to find any instances of recovery. Swenson and Ladd, discussing this condition in November, 1945, state, "This disease caused by pancreatic insufficiency, is uniformly fatal." They reported that they were able to clear the intestinal tract using pancreatic solutions through an enterotomy, but that death resulted from pulmonary infections within a short time.

Table I summarizes all of the known reported and 15 unreported cases through Sep-

From the Babies Hospital, New York, and the Departments of Pediatrics and Surgery, College of Physicians and Surgeons, Columbia University. This work was aided by the Commonwealth Fund.

TABLE I.—SUMMARY OF REPORTED AND UNREPORTED CASES OF MECONIUM ILEUS ASSOCIATED WITH CYSTIC FIBROSIS OF THE PANCREAS

Case report by	Age on admission	Operation	Age at death	Complications
1. Landsteiner 1905	5 days	Ileotomy	5 days	
2. Kornblith and Otani 1929	4 days	Laparotomy with drainage to cecum	5 days	Perforation of ileum
3. Dodd 1936	2 days	None	10 days	Early pneumonia; partial intestinal obstruction
4. Bronaugh and Lattimer 1940	1½ days	Resection of ileum with end-to-end anastomosis	5½ days	
5. Denzer 1941	2 days	Ileostomy	?3 days	
6. Sobel 1941	2 days	Ileostomy	23 days	Purulent bronchitis; pneumonia
7. Hurwitt and Arnheim 1942	1 day	Reduction of volvulus	3½ days	Volvulus; peritonitis
8. Kaufman and Chamberlin 1943	1 day	None	3 days	Prematurity
9. Sprenger 1942	4 days	5th day—Drained through Meckel's diverticulum	8 days	Meckel's diverticulum—peritonitis
10. Wissler and Zollinger 1945—case 18A	4 days	Enterotomy—removal of meconium by suction. Ileostomy	7 wks.	Bronchiectasis Focal pneumonia Enterocolitis
11. Glanzmann and Riniker 1946	1 day	Meconium massaged into colon	5 mo.	Bronchitis Abscesses of lung
12. Andersen	2 days	Reduction of volvulus	3 days	Volvulus—Failure of attachment of cecum and ascending colon
13. Andersen	3 days	Section of peritoneal bands	31 days	Congenital peritoneal bands
14. Andersen	1 day	Excision of volvulus and mesenteric cyst. Double enterostomy	3 days	Volvulus Cyst of mesentery
15. Andersen	1½ days	Resection of volvulus; double enterostomy	26 days	Volvulus Congenital peritoneal bands
16. Andersen	2 days	Ileocolostomy	7 days	Rupture of ileocolostomy; peritonitis
17. Andersen	2 days	Section of peritoneal bands	6 days	Congenital peritoneal adhesions Peritonitis due to staphylococcus aureus
18. Andersen	4 days	None	5 days	Gangrene of ileum; peritonitis
19. Hiatt and Wilson—Case 1	1 day	Ileotomy	Living 26 mo.	Volvulus
20. Hiatt and Wilson—Case 2	18 hrs.	Ileotomy	Living 26 mo.	
21. Hiatt and Wilson—Case 3	10 hrs.	Ileotomy	Living 15 mo.	
22. Hiatt and Wilson—Case 4	12 hrs.	Ileotomy	6 days	
23. Hiatt and Wilson—Case 5	2 days	Ileotomy	3 days	Escherichia coli bacteriemia Peritonitis
24. Hiatt and Wilson—Case 6	2 days	Ileotomy	4 days	Devitalized loop of ileum
25. Hiatt and Wilson—Case 7	2 days	Ileotomy	Living 3½ mo.	
26. Hiatt and Wilson—Case 8	1 day	Ileotomy	Living 2 mo.	Bronchopneumonia

tember, 1947. During the past 2 years 8 patients have been admitted to Babies Hospital shortly after birth with signs of intestinal obstruction in whom meconium ileus was found at operation. In all but 1 case, pancreatic insufficiency was demonstrated either by chemical analysis of duodenal secretions postoperatively or at autopsy. Four infants have survived, the two oldest being more than 2 years of age. They are reported in detail because it is felt that early and proper surgical intervention, followed by medical management and planning, may offer some of these infants a greater life expectancy.

CASE 1. C. F. A white female infant, 24 hours old, weighing 2600 grams, was admitted to the sur-

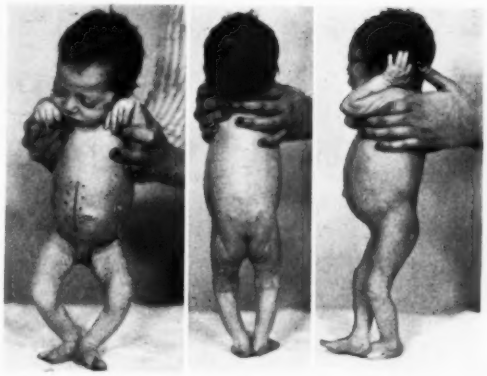
gical service of the Babies Hospital on September 6, 1945, because of failure to pass meconium since birth, associated with the development of distention and vomiting of green material. The pregnancy had been uneventful and the family history was negative. The baby appeared well developed and well nourished with a markedly distended abdomen—39.5 centimeters in circumference. The rectum admitted the examining finger, but was empty and small. X-ray examination of the abdomen at this time revealed a moderate small gut distention, confined for the most part to the left abdomen. The right abdomen was free except for one single distended loop seen in all films. A lipiodol enema showed a small, but essentially normal colon. The diagnosis entertained at the time was small gut obstruction due to atresia, stenosis, or volvulus of the ileum. In consequence the abdomen was opened, and a volvulus of a loop of ileum was found, which on further examination appeared to be secondary to a meconium ileus. The volvulus was reduced and the abnormal meconium completely removed through a small ileotomy by a technique to be described later. The ileotomy was closed, the bowel was replaced and the abdomen closed without drainage.

For the first four postoperative days the baby's course was rather stormy and she was maintained on parenteral fluids. Nasogastric suction was carried out during this period. On the second postoperative day a small amount of meconium was passed per rectum and from then on the baby had stools at normal intervals. Water was given by mouth on the fourth postoperative day and a day later an evaporated milk formula (1:3 plus 5 per cent cane sugar) was started. Pancreatin in 5 per cent solution was administered through the nasogastric tube until the baby was taking food per os; pancreatin was then given per os in doses of 0.5 gram with each feeding, a total of 3.0 grams daily.

Duodenal drainage was performed at the end of the third week in the hospital. Analysis revealed a tryptic activity of 2.0 units per cubic centimeter (the normal is 100 plus) confirming the diagnosis of cystic fibrosis of the pancreas associated with meconium ileus. At this time (at 3 weeks of age) the diet was changed to a formula containing protein milk powder 60 grams, glucose 30 grams, casein hydrolysate 6 grams, and water to make 720 cubic centimeters. The following vitamin supplements were also given: B complex 2 cubic centimeters, twice daily; oleum percomorphum 12 drops once a day; ascorbic acid 50 milligrams once a day; and pancreatin was continued at a dose of 3.0 grams daily (0.5 grams per feeding or bottle).

Intramuscular penicillin was administered for the first 2 weeks to control infection. Sulfadiazine, in prophylactic doses (0.1 gm. twice daily), was given for the remainder of the hospital stay.

The baby gained 400 grams in the first 3 weeks and after being changed to a protein milk formula continued to do well. She was discharged on the 52nd hospital day, weighing 3,830 grams. She has been followed since in the out-patient department, and at the age of 26 months measured 89 centimeters in length and weighed 12,870 grams. Except for an occasional transitory upper respiratory infection, she has had no difficulties (Fig. 1).



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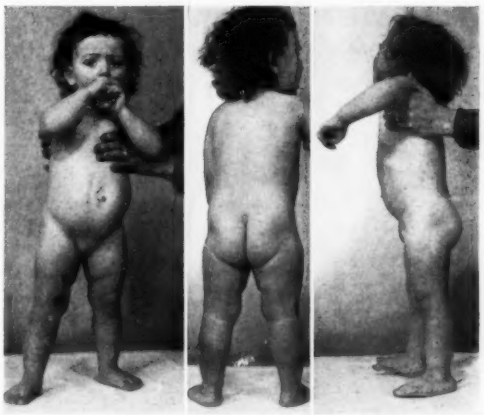


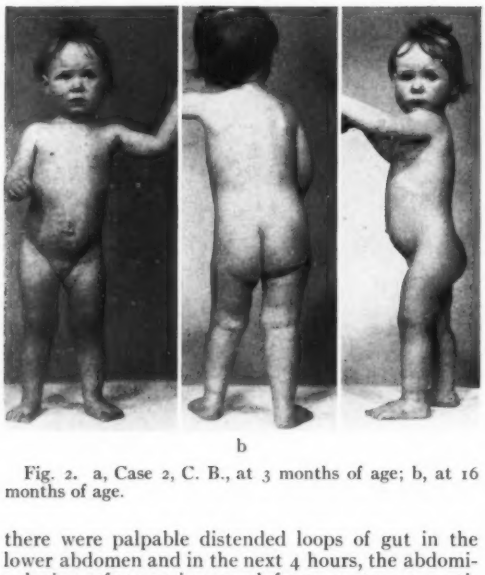
b

Fig. 1. a, Case 1, C. F., at 1 month of age; b, at 15 months of age.

Case 2. C. B. A white female infant was born on the Sloane Maternity service of the Presbyterian Hospital on September 13, 1945, weighing 3,510 grams. Pregnancy and labor were uneventful. One year previously the mother had given birth to an apparently normal male infant who, soon after birth, developed signs of intestinal obstruction and at autopsy was found to have meconium ileus associated with cystic fibrosis of the pancreas.

During the first 24 hours the baby appeared well, but did not pass meconium and regurgitated the glucose taken by mouth. At 18 hours after delivery

a



b

Fig. 2. a, Case 2, C. B., at 3 months of age; b, at 16 months of age.

there were palpable distended loops of gut in the lower abdomen and in the next 4 hours, the abdominal circumference increased from 33 to 37 centimeters. Rectal examination at this time revealed a small, empty rectum.

The infant was transferred to the Babies Hospital. Nasogastric suction was started and parenteral fluids were administered. A roentgenogram of the abdomen on the following day showed loops of distended gut in the left upper quadrant. A diagnosis of intestinal obstruction probably due to meconium ileus was made and laparotomy was performed. Large, dilated, purple-hued loops of ileum contained inspissated meconium. Through an enterotomy wound the gut was completely freed of this material. Before closing the enterotomy 10 or 15 cubic centimeters of 5 per cent pancreatin in water was instilled into the ileum. The abdomen was closed without drainage. Parenteral fluids, nasogastric suction and general supportive measures, including blood and plasma infusions, were instituted immediately. For a few days there was a little relief of the abdominal distention, but on the third postoperative day meconium began to pass per rectum, and the baby had normal stools. Pancreatin was given every 4 hours while the nasogastric tube was in place, and the tube was clamped for 1 hour after each instillation. Upon removal of the tube, pancreatin was continued per os and the baby started on karo water. On the fifth postoperative day an evaporated milk formula was begun. Duodenal drainage done on the tenth postoperative day revealed less than 1.4 units per cubic centimeter of tryptic activity. This confirmed the diagnosis of cystic fibrosis of the pancreas associated with meconium ileus in this child and the diet was changed to protein milk powder 40 grams, glucose 10 grams, casein hydrolysate 6 grams, water to 360 cubic centimeters. Vitamin supplements and pancreatin were given as in the preceding case, and continued after discharge. At 8 weeks the diet was again changed to hi-pro 85 grams, glucose 20 grams, casein hydrolysate 10 grams, and water to 600 cubic centimeters. At 10 weeks of age egg yolk and strained string beans were added to the diet—one serving of each daily.

The remainder of the hospital stay showed a general improvement. On two occasions, the infant had episodes much like celiac crises which were marked by an increase in the number of stools, a sudden weight loss and vomiting. These episodes responded rapidly to administration of parenteral fluids and plasma. Penicillin was given for the first 2½ weeks, and again for 2 weeks when an upper respiratory infection was present. During the last 17 days, sulfadiazine was given as a prophylactic measure (0.1 gm. twice daily).

Since discharge she has been followed in the outpatient department. She has had two additional admissions to the Babies Hospital for the treatment of bronchopneumonia, the first at about 9 months of age, and the second at about 18 months. Both illnesses responded well to sulfadiazine given orally, and to penicillin by aerosolization.

In spite of these two episodes she has grown well and gained regularly and now, at 26 months of age, weighs 10,900 grams and measures 80 centimeters in length (Fig. 2).

Case 3. A. F. A white male infant was admitted on August 18, 1946 at 10 hours of age after a normal delivery at another hospital. No abnormalities were noted at birth. He began to vomit bile-stained material within the first 4 hours and continued to do so until admission. No meconium was passed per rectum. A sibling had died 1 year previously with a similar clinical picture and was found at autopsy to have meconium ileus with cystic fibrosis of the pancreas.

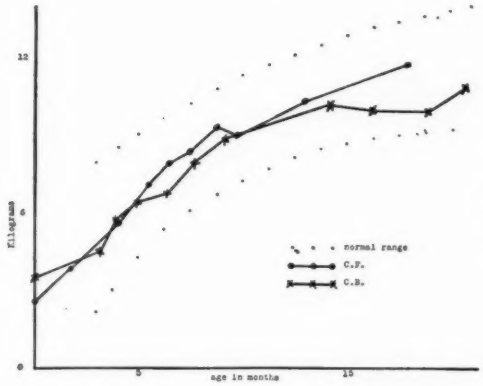


Fig. 3. Weight curves of Cases 1 and 2, compared with the normal mean.

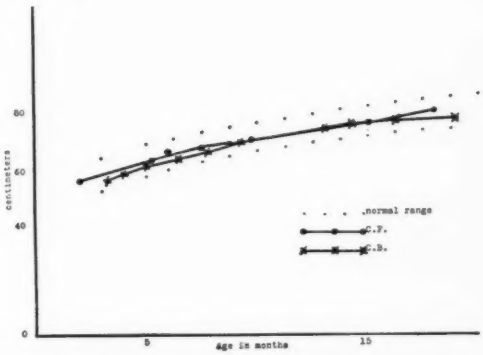


Fig. 4. Height curves of Cases 1 and 2, compared with the normal mean.

Examination revealed a tense. distended abdomen and an empty hypoplastic rectum. Crepitation could be elicited in the left upper quadrant of the abdomen and a large mass could be appreciated running transversely across the abdomen. Three position roentgenograms revealed dilated upper small gut loops containing fluid levels. Because of the history of meconium ileus in the sibling and the above findings, a diagnosis of meconium ileus was made. The operation was performed 30 hours after birth. The 20 hour preoperative period in the hospital was used for hydration and tube suction of the stomach.

The operation was performed through a right rectus incision, and the diagnosis of meconium ileus was confirmed. The mass and crepitation noted on physical examination were due to a tremendously hypertrophied and dilated loop of upper ileum which had undergone a 360 degree volvulus and was gangrenous, but not yet perforated. This was resected and the remaining meconium completely removed by saline irrigation through a No. 16 catheter utilizing a pursestring suture around each of the cut ends of the gut. When the gut was completely empty of meconium, an end-to-end anastomosis was performed; an inner layer of continuous No. 000 and an outer seroserous layer of interrupted No. 0000 silk being used. The operative wound was closed in layers without drainage.

Summary of surgical pathology report: The specimen is a greatly dilated segment of small bowel 40 centimeters in length with a maximal diameter of 5.2 centimeters proximal to the site of a contracting twist of the gut. Microscopic examination shows early gangrene of the dilated portion.

Postoperatively the child was put in an incubator equipped for oxygen administration, gastric suction was maintained, and supportive treatment with saline, plasma, and blood was given. Penicillin (10,000 units) was given intramuscularly every 3 hours and 0.5 gram of pancreatin in solution was instilled though the nasogastric tube and the tube clamped for 1 hour after each instillation. The child began to have bowel movements on the third postoperative day and was started on karo water on the fourth postoperative day; this was supplanted by formula on the sixth postoperative day. For the rest of his hospital stay, the child received vitamins A, D, and B complex, and pancreatin 3 grams once a day. Sulfadiazine was started on the eighteenth postoperative day because of a few pulmonary rhonchi and continued until the time of discharge. On the ninth postoperative day a high protein formula for fibrocystic disease of the pancreas was initiated. The wound healed per primam. A duodenal drainage was done on the twenty-ninth postoperative day, revealing only 5.2 units per cubic centimeter of trypsin in the duodenal secretions.

The child was discharged on the thirty-second postoperative day slowly gaining weight and free of pulmonary symptoms. He is being maintained at home on a high protein, high carbohydrate, low fat diet, and pancreatin. He was last seen on October 4, 1946, with a cough, but no râles could be heard and the chest was clear on fluoroscopy. On October 22, 1947, he was reported as thriving although he had had several respiratory infections during the preceding year.

Case 4. B. G. M. A male child 12 hours old was admitted with a history of vomiting bile-stained material shortly after birth and failure to pass meconium by rectum. The abdomen was noted to be distended at birth. Family history revealed that a sibling had died of an intestinal obstruction at 6 days of age. Examination revealed a markedly distended abdomen and an empty collapsed rectum. Roentgenograms revealed dilated upper small gut loops containing fluid levels. Small bubbles of air could be seen more distally. Because of these findings, a preoperative diagnosis of meconium ileus was made.

At operation this diagnosis was confirmed. However, there were some marked variations in the pathological findings which could be recognized as diminishing the chances of successful intervention. The degree of hypertrophy of the upper ileum and the lower jejunum was much less than usual and the length of the atrophic ileum was three times what is usually seen. The impression of a more severe form of the disease was obtained. However, all the abnormal meconium was removed in the usual manner and the abdomen closed without drainage.

Postoperatively the baby did not have any stools and died after 5 days with progressive distention, circulatory failure, and sclerema. No autopsy was obtained.

CASE 5. B. G. C. A female child 52 hours old was admitted with a history of vomiting and absence of stools since birth. The family history was negative. Examination revealed a baby who appeared dehydrated and feeble with a markedly distended abdomen and a small empty collapsed rectum. The skin had a decidedly icteric tinge. Roentgenograms showed dilated small gut loops containing fluid levels. We were unable to make a definite diagnosis although meconium ileus was strongly suspected.

After a 9 hour period of hydration and suction of stomach contents, the abdomen was opened and a typical meconium ileus with volvulus was found. The gut was easily cleared of abnormal meconium by the technique to be described and the abdomen closed without drainage.

Postoperatively the child seemed to be doing well, but suddenly died at the end of the first postoperative day. Autopsy revealed a profuse peritonitis. Cultures of the meconium removed from the proximal and distal segments of ileum at operation both yielded a pure culture of Escherichia coli. Blood cultures before death also yielded Escherichia coli. Therefore, the cause of death was judged to be bacteriemia and peritonitis due to Escherichia coli. Fibrocystic disease of the pancreas was found at autopsy.

CASE 6. N. K. A white male infant 2 days old was admitted to Babies Hospital because of persistent vomiting and distention since birth and failure to pass meconium per rectum. This child was the result of the second pregnancy in this family, the first ending in a miscarriage. Normal delivery occurred at another hospital.

Examination revealed a moderately dehydrated infant with a distended abdomen and a small empty rectum. Three-position films of the abdomen showed dilated upper intestinal loops containing gas and some fluid. The lower abdomen showed only an opaque medium of water density containing occasional minute air bubbles. Because of this roentgen picture and the solid consistency of the abdomen by palpation as well as the small empty rectum, the diagnosis of meconium ileus was made.

Following a three hour period of hydration and nasogastric suction, the abdomen was opened through a right rectus incision. In addition to meconium ileus, the patient had a 360 degree volvulus of a loop of upper ileum with impairment of circulation, but no appreciable gangrene. The volvulus was reduced and the abnormal meconium removed in the usual manner. The abdomen was closed without drainage.

Postoperatively, the baby continued to be distended in spite of nasogastric suction and pancreatin every 6 hours. The stools were very scanty and ceased altogether on the third postoperative day. In spite of penicillin, streptomycin, and general supportive measures, the baby died on the fourth postoperative day.

Autopsy revealed that the probable cause of death was the devitalized loop of ileum that had been involved in the volvulus. It had remained devitalized and the mucosa was actually gangrenous. There was a marked peritoneal reaction around this loop. Cystic fibrosis of the pancreas was also confirmed at autopsy.

CASE 7. J. H. M. A male infant of 2 days was admitted with a history of vomiting and progressive distention since birth. Delivery was normal. The family history was negative with respect to pancreatic deficiency.

Examination revealed a moderately dehydrated infant with a hard, distended abdomen and a small, empty rectum. Roentgenograms showed large dilated loops of intestine with air-fluid levels.

After 3 hours of nasogastric suction and hydration the patient was operated upon through a right rectus incision and a meconium ileus was found. There was no volvulus. The abnormal meconium was evacuated and the abdomen closed without drainage. Three grams of pancreatin in 40 milliliters of saline was inserted into the gut before closing the enterostomy.

The usual postoperative regimen of nasogastric suction, pancreatin, saline, plasma and penicillin was carried out and the course was uneventful. Bowel movements began on the first postoperative day and feeding was started on the third postoperative day. The wound healed per primam. Duodenal drainage revealed only 1.4 units per cubic centimeter of trypsin in the duodenal fluid.

The patient was discharged from the hospital on the 29th postoperative day on a high caloric, high protein, low fat formula with 3 grams of pancreatin once daily.

No difficulties have been encountered during the 3½ month period to the present.

CASE 8. P. C. A white male infant was first seen at 24 hours of age with a history of persistent vomiting and increasing abdominal distention since birth. Normal delivery occurred at another hospital. The family history was noncontributory.

Examination revealed a moderately dehydrated baby with a markedly distended hard abdomen. Large, dilated, nontympanitic loops of intestine could be palpated through the abdominal wall. The rectum was small and empty. Roentgenograms showed dilated upper intestinal loops filled with gas and fluid. No gas was seen in the rectum or colon.

After 4 hours of hydration and nasogastric suction, the patient was taken to the operating room and the abdomen was opened through a right rectus incision. A typical meconium ileus was found with a mild volvulus in the upper ileum without circulatory impairment. The volvulus was reduced and the abnormal meconium removed in the usual fashion through an enterotomy. Three grams of pancreatin in 40 milliliters of saline was instilled before closing the enterotomy.

The postoperative course was uneventful. The infant began having bowel movements on the first postoperative day. The postoperative regimen included nasogastric suction with instillation of pancreatin every 6 hours, penicillin, streptomycin, saline and plasma. Nasogastric suction was discontinued on the third postoperative day and feedings were begun. Trypsin was found to be almost absent from the duodenal juice in the third postoperative week.

In the 2 months following discharge, the patient did not do well because of recurrent pulmonary difficulties. At the time of preparation of this paper he was again in the hospital with a severe bilateral pneumonia for which tracheotomy was performed to facilitate suction of the bronchial tree. He died at the age of 3 months. Postmortem examination confirmed the diagnosis of cystic fibrosis of the pancreas. The ileum and colon were of normal dimensions throughout.

In reviewing these 8 cases, we emphasize the fact that combined surgical and medical treatment is necessary. The literature reveals that the few cases of meconium ileus which have been successfully treated surgically have succumbed to subsequent respiratory complications of the type usually associated with pancreatic insufficiency resulting from cystic fibrosis.

Since the recognition of this syndrome in 1905, the longest reported postoperative survivals have been a few weeks or months. Our Cases 1, 2, 3, and 7 represent the first successful results to be reported.

SURGICAL CONSIDERATIONS

The main purpose of the surgical treatment of these patients is the complete removal of the abnormal meconium as quickly and as gently as possible. In order to do this, an accurate understanding of the presenting pathology is necessary. In all these cases, approximately the distal half of the small gut is filled with abnormal material. This varies from semiliquid to extremely tenacious meconium in the lower jejunum and upper ileum, and becomes gradually more desiccated in the more distal loops so that a segment of the terminal ileum, which varies in length from 20 to 40 centimeters, is filled with actual concretions. The concretions are hard, greyish white and they make a perfect cast of the inside of the ileum.

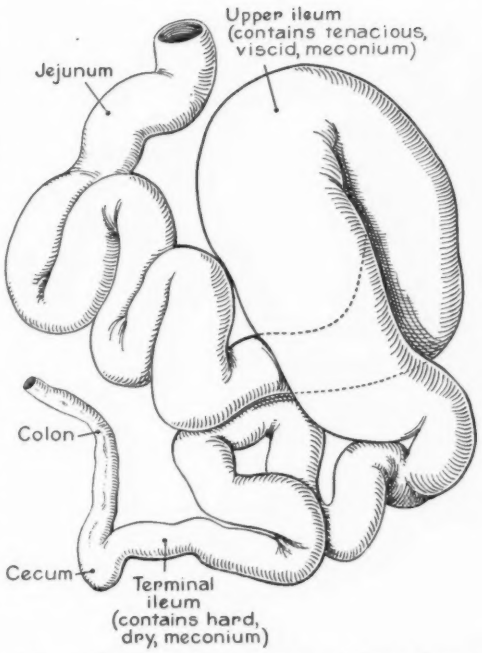


Fig. 5. The external appearance of the intestine in typical meconium ileus.

The most striking abnormality is the hypertrophy and dilatation of the mid-ileum. This hypertrophy and dilatation begins usually in the lower jejunum, becomes maximal in the mid-ileum and ends 20 to 40 centimeters from the ileocecal valve. The transition from the dilated portion of the ileum where the meconium is semifluid to the small thin-walled terminal ileal segment containing the above described concretions is sometimes abrupt. The area of maximum hypertrophy and dilatation in the mid-ileum will often measure 7 centimeters in diameter while the terminal segment averages approximately 1.5 centimeters in diameter. The large intestine in each case in the series was found to be empty, small, and hypoplastic.

This is a very striking pathological picture, and it is quite obvious that the gut has been working unsuccessfully for weeks or even months before the birth of the child in an attempt to propel this abnormal material. We have gained the impression that the greater the hypertrophy of the proximal portion of ileum and the shorter the segment of relatively atrophic terminal ileum, the better the chances are for successful operative intervention. In one of the cases (Case 4) that ended fatally there was an extremely long atrophic segment of ileum filled with concretions and a much lesser degree of hypertrophy of the ileum proximal to it than was observed in the successful cases; postoperatively the intestine seemed unable to propel material along the gastrointestinal tract.

Essential parts of the operative technique are as follows: a 10 centimeter right rectus incision is made with its midportion level with the umbilicus. The rectus muscle is split and the peritoneum and posterior sheath are opened vertically. The dilated loops are allowed to protrude while the status of the gut is evaluated. An enterotomy site is chosen just proximal to the atrophic terminal segment at the point where the gut becomes significantly dilated. A pursestring suture of fine silk is placed in the serosa and a portion of the muscularis. A half-hitch is tied in the suture and left loose. A 1 centimeter incision is then made into the lumen of the gut and a small catheter is inserted as far as possible toward the ileocecal valve. The pursestring suture is drawn tight around the catheter and held by the assistant. Saline is then injected through the catheter until the entire terminal ileum is dilated. This effect is enhanced by constricting the bowel at the ascending colon and proximal to the enterotomy. When considerable pressure has been obtained, the pursestring suture is loosened and the fluid and chunks of meconium are allowed to escape into a sterile emesis basin. This procedure can be repeated many times, the catheter being advanced toward the ileocecal valve each time. In this manner, much of the material can be removed. The large concretions, however, may have to be "milked" toward the enterotomy manually. This is much easier to do after the gut has been dilated with saline and there is some saline under pressure behind them to help them along. Once the terminal ileum is completely freed of its contents, the constriction at the ascending colon can be removed and saline is allowed to flow into the rest of the colon. The catheter is then removed and reinserted proximally into the ileum, and the same maneuvers are carried out until the gut is completely freed of inspissated or otherwise abnormal meconium.

At this point, a solution of pancreatin can be inserted through the catheter into the ileum. This was done in 4 cases. However, great care should be taken not to spill any of this potent digestive agent into the peritoneal cavity or wound. Our experience leads us to believe that instillation of pancreatin solution at operation is not an important part of the technique for the reason that pancreatin solution can be given through the nasogastric tube postoperatively.

The catheter is then removed and the enterotomy closed by inverting the edges and tying the pursestring suture. The abdomen is closed in layers and reinforced with retention sutures. There is no rational reason for performing any form of "ostomy" or using any form of drainage.

The preoperative diagnosis cannot be made with any certainty in most cases. The radiological picture is similar to that seen in atresia or stenosis of the lower small gut. Pugh states that Neuhauser made a correct preoperative diagnosis in 4 of 10 cases, and offered as radiological criteria the finding of small gas bubbles in a medium of water density distal to the main column of gas in the upper small gut. This picture was seen in only 3 of our cases with any degree of definiteness. In 3 of our cases the diagnosis was strongly suspected because of the known familial incidence and the fact that a sibling had previously died of proved or suspected meconium ileus. The most important diagnostic criterion is the hard consistency of the abdomen noted on palpation.

The importance of early surgical intervention is obvious in these cases. In one child the gut was already gangrenous, but fortunately not perforated. In another in whom the peri-

od between birth and operation was 52 hours, death was due to Escherichia coli peritonitis and septicemia; the presence of this organism in the gastrointestinal tract within 2½ days of the time of birth was further confirmed by cultures of the meconium at operation. A certain period of observation is necessary to rule out the possibility of transient meconium plugs causing temporary obstruction. It also allows time for decompression of the stomach with a tube under constant suction and the correction of the disturbed water and electrolyte balance. The decision for operative intervention at the end of this time depends upon the absence of gas in the colon as seen by roentgenogram. In the presence of colonic gas, further delay is justified.

Another very important consideration in these cases is the association of meconium ileus with volvulus. Because of the tremendous hypertrophy and elongation of the small gut before birth in this disease, it is a common experience to find a loop twisted upon itself resembling a volvulus. There is one important difference, however, in that the gut wall in the involved loop is markedly hypertrophied, a fact which indicates to the surgeon that the primary pathology is more distal. The presence of this phenomenon was observed in 5 of our patients.

In evaluating the causes of death in the 3 infants who did not survive the postoperative period we find that one had a very severe form of the disease with an unusually long hypoplastic segment of terminal ileum and minimal hypertrophy proximal to this. The 2 other deaths, we feel certain, were due to our failure to resect devitalized gut that had been involved in a volvulus. The demands on this gut in the postoperative period to propel material through underdeveloped terminal ileum and colon require that it be healthy. By devitalization we mean any loop that appears to have lost its full powers of peristalsis. Since the terminal ileum and entire colon are very thin walled and approximately the size of an ordinary lead pencil most of the propulsive power must come from the hypertrophied small gut proximal to this. If a loop with poor peristaltic power is allowed to remain it will probably prove fatal to the patient. In Case 3, in which the loop of gut involved in the volvulus was actually gangrenous, resection plus removal of abnormal meconium was quite successful.

The three most important surgical principles to be kept in mind are: (1) complete evacuation of abnormal meconium; (2) appreciation of the fact that meconium ileus may be the underlying cause of a volvulus in the neonatal period; and (3) resection of all devitalized gut.

MEDICAL MANAGEMENT

The reports of Andersen (1, 2) indicate that the earlier the diagnosis of pancreatic insufficiency is made, the better is the prognosis for prevention of respiratory disease and for survival. The outlook is best if the diagnosis can be made and proper therapy commenced before the onset of respiratory disease.

In the 4 surviving infants operated upon at Babies Hospital the diagnosis of pancreatic fibrosis was suspected from the first because of the findings at operation. As soon as the condition of the infants allowed, duodenal drainage was performed and analysis of the secretions for trypsin carried out. The results indicated the presence of pancreatic insufficiency in all cases, confirming the diagnosis of cystic fibrosis of the pancreas.

Because of the previously known association of meconium ileus with cystic fibrosis of the pancreas the dietary changes advocated by Andersen were instituted even before confirmation of diagnosis had been obtained by demonstration of low trypsin activity in duodenal juice. All patients were started on a protein milk formula fortified with glucose and casein hydrolysates; the exact composition of the diet for each child is described in the case reports. Later hi-pro was substituted for protein milk although the latter could well have been continued. Since discharge from the hospital various additions have been made to the diets and at present each child of suitable age is receiving strained fruit juices, pot cheese, fruits, vegetables, jello, junket, egg, and meats (boiled, broiled, or roasted, with all visible fat removed). The formulae are continued with the proportions of milk and simple sugar increased to bring the caloric value up to the individual child's requirement (Table II).

TABLE II.—PRINCIPLES OF DIET CALCULATION

Calories per kilogram of body weight..... 150
Total grains protein per kilogram of body weight. 6 – 10
Protein as hydrolyzed protein grains per kg. of body weight..... 1.5– 2

	Cal./ gm.	Cal./ oz.	Cal./ tbs.	Protein %
Mead's protein milk	5.1	153	41	37.0
Hi-pro	4	121	30	41.0
Hydrolyzed protein (Mead's protolysate)	4	120	30	77.0
Banana powder	3.0	109	21.6	6.87
Glucose	4	120	40	0

Compute formula calories as follows:
⅔–¾ of caloric needs as protein milk or hi-pro and hydrolyzed protein.
¼–⅓ as banana powder or glucose or a mixture of the two.
Pancreatin: 0.5 gram to be added to each bottle just before feeding.
Solid foods: The following may be offered in increasing amounts (at and after 3 months): mashed ripe banana; egg yolk; liver, scraped beef, beef juice; pureed string beans, carrots, squash, applesauce, other pureed fruits.

It is now well established that children with fibrocystic disease of the pancreas require a high vitamin intake, particularly the vitamins of the fat soluble group. Therefore, these children were immediately given high doses of vitamins and continue to receive them at the present time: oleum percomorphum, 30 drops daily; ascorbic acid, 50 milligrams daily; B complex, 4 cubic centimeters twice daily.

As a substitute for the absence of pancreatic function, pancreatin was given by mouth and the older patients now continue to receive 1.0 gram per meal.

The special diet, the added vitamins, and the pancreatin will always be required by the children for several reasons. The pancreas is not expected to resume function and the intolerance to fats will remain. Although some ability to utilize starches will develop, full starch allowances cannot be attained. Therefore, a high protein intake is necessary and must be continued, since it will not only supply body building material but will provide energy as well.

At the present time, 26 months after operation in the first 2 infants surviving and 15 months postoperatively in the third survivor, these 3 children are alive and well. The fourth infant is 3½ months old and the fifth succumbed to pulmonary disease at 2 months of age. Of the 5 children surviving operation, only 1 has developed chronic pulmonary disease—roentgenograms and physical signs are normal—one child had a slight cough when last seen in follow-up clinic and one child (C. B.) was readmitted to the hospital in April, 1947, with a diagnosis of bronchopneumonia, from which she has recovered. Up to the present the first 3 children have developed normally—physically and mentally.

In brief, the features of management are: (a) low fat, high protein diet; (b) high vitamin intake—including A, B complex, C, and D; (c) oral pancreatin daily; (d) the early use of chemotherapeutic and antibiotic agents to combat infection—in adequate doses prophylactically and therapeutically: (e) frequent checkup, including chest x-ray examination.

SUMMARY

1. Eight cases of meconium ileus are described. All of the infants presented signs of intestinal obstruction soon after birth and came to operation as soon as their disturbance of water and electrolyte balance had been corrected.

2. A new technique is described for the removal of obstructing meconium by irrigation through an ileostomy wound and milking out of bulky masses so as to re-establish the intestinal channel. Postoperative drainage is not required.

3. In 5 cases there was an associated volvulus of a loop of ileum, presumed to result from excessive writhing of elongated and hypertrophied coils of small gut proximal to the obstructing inspissated meconium. In 4 of these cases the volvulus was corrected by simple unwinding; in 1 case resection of gangrenous bowel was required; and in 2 cases failure to recognize the gravity of the circulatory impairment at the time of operation was a contributory cause of the unfavorable outcome.

4. In all 8 cases the existence of associated cystic fibrosis of the pancreas was established. We believe that pancreatic insufficiency underlies all instances of meconium ileus. The history of pancreatic fibrosis or of meconium ileus in a sibling supports the preoperative diagno-

sis of meconium ileus in a newborn infant with intestinal obstruction.

5. Five of the 8 patients coming to operation were successfully relieved of intestinal obstruction. The oldest of the survivors is now more than 2 years old. The prognosis of the survivors is dominated by the underlying pancreatic disease.

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CARCINOMA OF THE BLADDER WITH BONE METASTASES

A Report of 8 Cases

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THE old idea that bone metastases secondary to carcinoma of the bladder are of rare occurrence seems still to prevail. In a previous communication one of us (H.L.K.) reported 5 cases and called attention to the fact that this condition occurs more frequently than is appreciated, and that it may occur with small papillary tumors that appear to be simple papillomas. As early as 1854, Schraut called attention to the fact that bone metastases do occur in cases of carcinoma of the bladder.

Articles in the older, as well as in the recent literature, generally dealt with the report of a single case. The renewed interest in this subject has been followed by articles that deal with a series of cases. Many of these cases are reported by roentgenologists and orthopedists in articles dealing with the general subject of bone metastases and, unfortunately, contain little or no detailed information. Among the urologists who have reported a series of cases may be mentioned Burkland and Leadbetter, Colston and Leadbetter, Graves, Jewett, Judd, Kretschmer, Sutherland, and Turner and Jaffe.

In the older textbooks the subject received scant attention. However, some authors, like Geraghty, Herman, and Hinman feel that bone metastases are an important and frequent finding. Beer, Colston, Geschickter, Judd, Kretschmer, Lemaitre, Turner and Jaffe, and many others, are of the opinion that the condition is more common than is generally believed.

The report of the Carcinoma Registry of the American Urological Association in 1934 showed the incidence of bone metastases to be 3.7 per cent of the 902 bladder tumors then recorded. The present paper is based on a series of 8 cases and a review of the literature.

CASE REPORTS

CASE 1. L. C. M., male, aged 73 years, entered the Presbyterian Hospital on the service of H. L. K. July 3, 1946. On July 8, 1946, a transurethral resection of the prostate and a bladder tumor was performed by Dr. N. J. Heckel. The pathological examinations revealed benign hypertrophy of the prostate and papillary carcinoma of the bladder. The patient was readmitted to the hospital on October 25, 1946 with the complaint of gross hematuria, with passage of blood clots of 4 days' duration.

Physical examination was essentially negative except for bilateral inguinal hernias. Rectal examination revealed an enlarged prostate, grade 1/2, soft and smooth, with no signs of carcinoma. The blood count and Kahn test were normal, the nonprotein nitrogen was 53 milligrams per cent and the urinalysis showed albumin 2+ and a grossly bloody urine.

Suprapubic cystostomy was performed on October 26, 1946 (H.L.K.) because of profuse hemorrhage. At operation a large ulcerating tumor located on the right lateral wall was found. The bladder was packed with gauze. Biopsy report stated papillary carcinoma (Fig. 1). Convalescence was uneventful and he was discharged November 16, 1946, with permanent suprapubic catheter drainage.

On June 15, 1947 he developed a painful swelling in the left clavicle. Ten days later, in attempting to turn himself, he heard a snap in the left clavicle, which was followed by severe pain. His physician made a diagnosis of pathological fracture due to metastatic carcinoma of the clavicle. The patient was bedfast at home and unable to have a roentgen-ray examination, but the clinical diagnosis seems perfectly obvious[1].

CASE 2. L. C. H., male, aged 60 years, entered the Presbyterian Hospital on the service of Dr. E. J. Berkheiser. In June, 1942, he underwent elsewhere a partial resection of the bladder for tumor with reimplantation of the left ureter into the bladder. The ureter became obstructed at the site of implantation and a left nephrectomy was done. In January, 1943, a transurethral resection of the prostate was done elsewhere. Two months before admission patient developed severe bilateral sacroiliac pain which radiated into the legs. The urinary symptoms were frequency, nocturia, dribbling and weakness of the urinary stream.

Physical examination revealed a left lumbar and a suprapubic scar. Severe pain was noted on pressure over the fifth lumbar vertebra. Rectal examination revealed a normal prostate. The blood count was normal. The urinalysis showed albumin 2+, with many red blood and pus cells.

[1]We are indebted to Dr. Theodore J. Smith for notes on the course of the patient's illness after he left the Presbyterian Hospital.

Roentgen-ray examination, March 15, 1943, revealed destruction of the 4th lumbar vertebra and the upper border of the sacrum, compatible with metastasis. A second roentgen examination on April 26, 1943, revealed destruction of the anterior border of the second and fourth lumbar vertebrae with some compression of the fourth lumbar vertebra compatible with metastasis (Fig. 2).

On April 6, 1943, a cordotomy was performed by Dr. A. Verbrugghen at the level of the third segment, for the relief of severe pain.

The patient continued his narcotic requirements, gradually failed and died on September 30, 1943.

Autopsy, September 30, 1943, revealed a papillary carcinoma of the bladder (Fig. 3); retrograde tumor implantations in the dilated left ureter; extensive metastatic carcinoma of the left renal fossa; extensive metastatic carcinoma of the lumbar spine (Fig. 4); metastatic carcinoma of the sacrum and lower thoracic vertebrae; metastatic carcinoma of the liver, lower lobe of right lung, pulmonary hila, upper mediastinal and peri-iliac lymph nodes.

CASE 3. S. B., female, aged 50 years, entered the Presbyterian Hospital on December 31, 1945. One year ago she developed hematuria, frequency, nocturia, urgency, and dysuria.

Blood examination, blood chemistry, Wassermann, roentgen-ray examination and intravenous pyelogram all were negative. The urinalysis showed a trace of albumin and the sediment showed red blood cells. The cystoscopic examination (H.L.K.) revealed five papillary tumors on the floor of the bladder. They were resected and the bases fulgurated. Pathological report showed papillary carcinoma of the bladder (Fig. 5).

The patient re-entered the hospital in June and October, 1946, and further resection and fulguration of bladder tumors was carried out.

Operation (H.L.K.) was performed December 16, 1946; it consisted of suprapubic cystostomy with wide resection of bladder wall and tumor. Pathological report showed papillary carcinoma of the bladder. Operation for closure of the fistula (H.L.K.) was carried out on January 27, 1947.

On March 17, 1947 patient complained of pain in her right lower chest. Roentgen-ray examination revealed a pathological fracture of the right ninth rib anteriorly (Fig. 6), a compression fracture of the upper border of the third lumbar vertebra, and multiple areas of bone destruction involving the pubic bones and the upper end of the right femur compatible with metastases (Fig. 7). A chest film revealed small areas of increased density scattered throughout both lung fields suggesting metastasis.

Deep roentgen ray therapy was instituted. Her convalescence was slow, requiring large quantities of narcotics for relief of pain. She was discharged on April 17, 1947 and died 3 weeks later. No autopsy was made.

CASE 4. M. T., male, aged 58 years, entered the Presbyterian Hospital on July 8, 1936. In 1934, he underwent elsewhere a transurethral fulguration of a bladder tumor and a litholapaxy. First admission to the Presbyterian Hospital was in May, 1936, when a transurethral resection and fulguration of a bladder tumor was done (H.L.K.). Microscopic report showed papillary carcinoma of the bladder (Fig. 8). One month prior to his present admission patient developed severe pain in the right hip and thigh, frequency of urination, nocturia, attacks of hematuria, and severe dysuria.

Fig. 1. Case 1. Typical papillary carcinoma of the bladder. ×80.

Physical examination revealed scars over the right upper and lower quadrants. A hard mass fixed to the symphysis pubis extended 4 fingers' breadth above the symphysis pubis. Palpation produced severe pain. Enlarged inguinal glands were noted on the right side. The rectal examination was negative.

The blood count was normal. The urinalysis showed 10,000 pus cells per cubic millimeter, and 800 erythrocytes per cubic millimeter. Culture of the urine showed Bacillus coli communis.

Roentgen-ray examination revealed destruction of the right superior and inferior rami of the pubis with thinning of the left pubis, compatible with bone metastases (Fig. 9). The patient was given deep roentgen-ray therapy and discharged from the hospital in fair condition on July 13, 1936. The patient died 4 months later.

Fig. 2. Case 2. Note destruction of the second and fourth lumbar vertebrae.

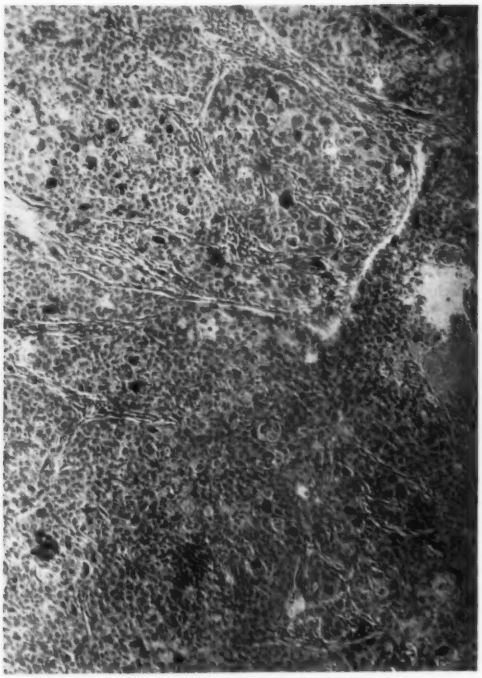

Fig. 3. Case 2. Typical papillary carcinoma of the bladder. ×80.

Case 5. M. A. C., female, aged 58 years, entered the Presbyterian Hospital on December 23, 1946. In February, 1946, a transurethral resection with fulguration of bladder papilloma was done (H.L.K.). Biopsy report revealed papillary carcinoma of the bladder (Fig. 10). In May, 1946, and in October, 1946, further transurethral resection and fulguration of bladder papillomas were carried out (H.L.K.). Biopsy report, October, 1946 revealed papillary carcinoma of the bladder with invasion of granulation tissue and smooth muscle.

Four days prior to admission patient developed gross hematuria, frequency, nocturia and dribbling at the end of urination.

Roentgen-ray examination, intravenous urograms and blood count were negative. Urinalysis showed 50 red blood cells per cubic millimeter.

Operation (H.L.K.) consisted of transurethral fulguration of an elevated area at the site of previous resection. Patient was discharged in good condition on December 25, 1946.

In the middle of March, 1947, the patient injured her right leg just below the knee. Six weeks later a swelling developed at the site of injury. A roentgenogram showed a circumscribed osteolytic destruction in the tibia just below the tibial tuberosity (Fig. 11). She was operated upon elsewhere and the cavity was curetted. The tissue removed was sent to one of us. The diagnosis was metastatic papillary carcinoma (Fig. 12) secondary to papillary carcinoma of the bladder. Subsequent roentgen-ray studies showed two lesions in the left lower tibia. The patient is now bedridden and failing rapidly.[1]

Case 6. T. G. T., male, aged 45 years, entered the Presbyterian Hospital on September 21, 1934. On November 6, 1933, a suprapubic cystostomy was performed elsewhere for the removal of a tumor of the bladder. Pathological diagnosis was papillary carcinoma of the bladder. He was readmitted to the same hospital because of multiple abscesses of the left kidney and postoperative obstruction of the left ureter. On January 15, 1934, a left nephrectomy was performed.

Seven months before admission patient developed severe pain in the left hip and thigh, requiring narcotics for relief. He cannot walk without the aid of crutches.

Physical examination revealed a suprapubic and left lumbar scar. Rectal examination was negative. The left lower extremity showed marked muscular atro-

[1]We are indebted to Dr. P. J. Stanul for the information of the patient's subsequent course.

Fig. 4. Case 2. Metastatic papillary carcinoma of the lumbar spine. ×80.

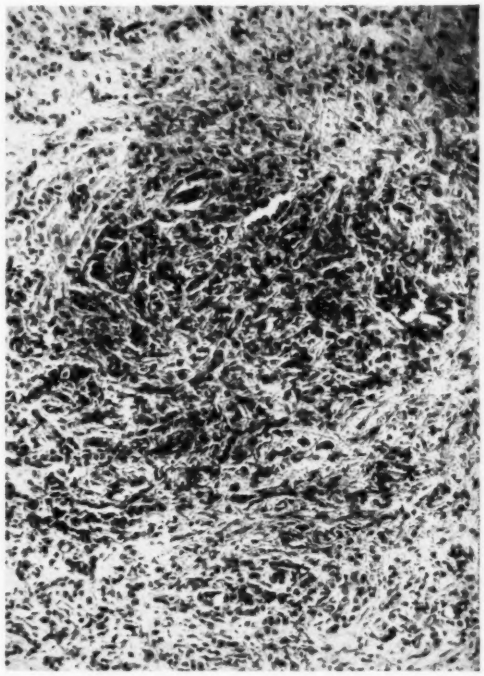

Fig. 5. Case 3. Typical papillary carcinoma of the bladder. ×80.

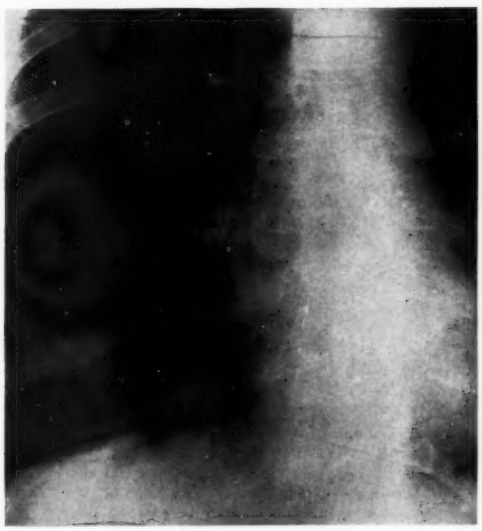

Fig. 6. Case 3. Note pathological fracture of the right ninth rib.

phy and pain on pressure over the left thigh and hip.

The blood count and blood Kahn were normal. Blood chemistry was normal. The urine contained 85 pus cells and 300 red blood cells per cubic milli-

Fig. 7. Case 3. Note multiple areas of destruction in pubic bones and right upper femur.

Fig. 8. Case 4. Typical papillary carcinoma of the bladder. ×80.

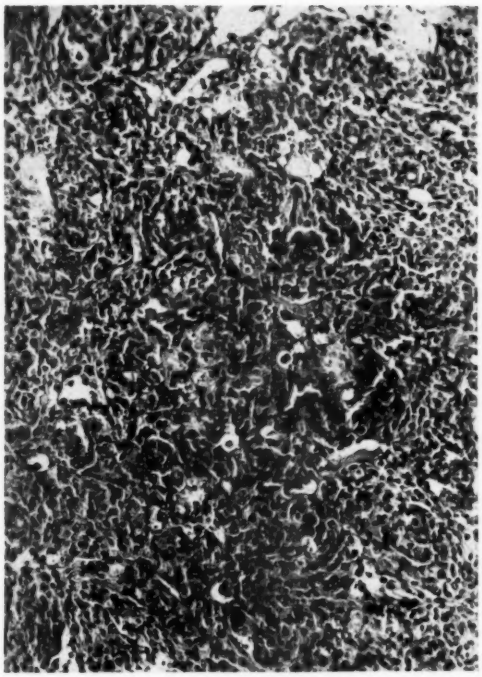

Fig. 10. Case 5. Typical papillary carcinoma of the bladder. ×80.

meter and on culture showed growth of Bacillus coli communis.

Roentgen-ray examination revealed marked destruction of the left pubis, the left lower ischium, and the lesser trochanter of the left femur with a fracture through this area. There was general thinness of the left ilium with very tiny areas of destruction. Findings were compatible with metastatic carcinoma (Fig. 13).

Fig. 9. Case 4. Note destruction of the right pubic bone.

Cystoscopic examination (H.L.K.) on September 22, 1934, and September 26, 1934, revealed a normal bladder. The patient was discharged on September 27, 1934, his condition unchanged.

CASE 7. C. B., female, aged 61 years, entered the Presbyterian Hospital on April 6, 1928. She had had a salpingo-oophorectomy in 1908 and a gall-bladder operation in 1920, performed elsewhere.

One year prior to admission she had had an attack of gross hematuria. This was followed by frequency, nocturia, urgency, and suprapubic pain. She has had two subsequent attacks of hematuria, one 6 months ago and one 2 weeks ago.

Physical examination revealed a mild cervical adenopathy, the scars of her previous operations and marked tenderness over the pubic bones. The blood count and Wassermann were negative. The blood nonprotein nitrogen was 49.5 milligrams per cent and the urea nitrogen was 24.2 milligrams per cent. The urinalysis showed albumin 1+, 340 pus cells, and 200 red blood cells per cubic millimeter and a few granular casts. Urine cultures were sterile.

Fig. 11. Case 5. Note the circumscribed destruction in the proximal end of the tibia.

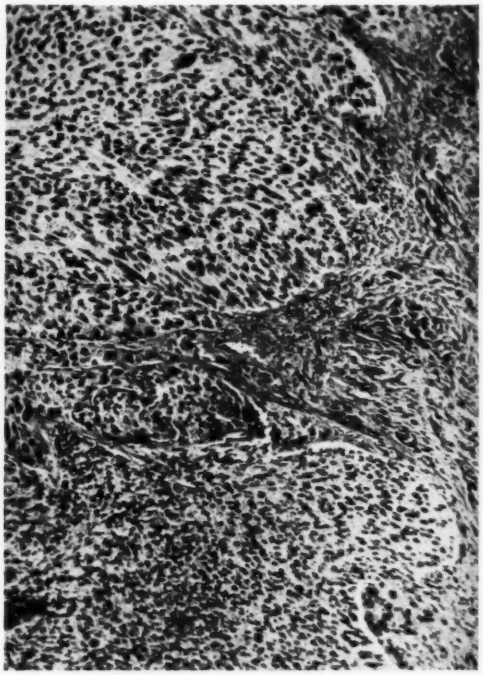

Fig. 12. Case 5. Metastatic papillary carcinoma of the right tibia. ×80.

Cystoscopic examination revealed a tumor of the bladder with areas of superficial necrosis.

Roentgen-ray examination revealed a destructive process of the pubis on either side of the symphysis, compatible with bone metastasis.

On April 11, 1928, a suprapubic cystostomy was done (H.L.K.). The tumor had extended beyond the bladder. Surgical diathermy was used and pieces of tissue were excised for diagnosis. Microscopic diagnosis: papillary carcinoma of the bladder. Patient was discharged from the hospital on July 3, 1928, and died December 2, 1928.

Case 8. R. A. F., male, aged 53 years, entered the Presbyterian Hospital on October 19, 1946. Elsewhere in 1937, a suprapubic cystostomy was performed for removal of papilloma of the bladder. Elsewhere, in 1938, a transurethral resection of the prostate was performed. In 1943, a left orchiectomy was performed because of abscess. In November, 1944, at the Presbyterian Hospital, a transurethral resection of the prostate was done with resection and fulguration of small papillary tumors on the trigone (H.L.K.). Pathological report was benign hyperplasia of the prostate and papillary carcinoma of the bladder (Fig. 14). In November, 1945, incision and drainage of a periurethral abscess (H.L.K.) was done. On March 18, 1946, a suprapubic cystostomy was done because of persistent hematuria, frequency, urgency, and pain. There were no papillomas in the bladder, but just distal to the vesical orifice papillomatous growths were removed for biopsy which showed papillary carcinoma. On March 28, 1946,

Fig. 13. Case 6. Note destruction of the left pubis, ischium, and lesser trochanter, with a fracture through the latter structure.

Fig. 14. Case 8. Typical papillary carcinoma of the bladder. ×80.

cystoscopic examination showed the bladder to be normal. Examination of the prostatic urethra showed many small papillomas which were resected and fulgurated (H.L.K.). Pathological report was papillary carcinoma.

Fig. 15. Case 8. Note destruction of the superior ramus of the left pubic bone.

Fig. 16. Case 8. Note destruction of the fifth lumbar vertebra.

On present admission to hospital patient complained of hematuria and severe pain in the lumbar region radiating into the left leg.

Physical examination revealed a suprapubic fistula; rectal examination showed a normal prostate. The blood count was normal, except for mild anemia. Blood nonprotein nitrogen was 39 milligrams per cent. Urinalysis showed a grossly bloody urine with albumin 1+ and pus cells 8 to 10 per cubic millimeter.

Roentgen-ray examination October 23, 1946 showed complete destruction of the fifth lumbar vertebra and an area of destruction involving the superior ramus of the left pubic bone (Figs. 15 and 16).

After he left the city, patient suffered a rapidly developing paralysis of both lower extremities. He had extreme pain in the lumbar and sacral areas and throughout the distribution of both sciatic nerves. He died in March, 1947.

The cases are summarized in Table I.

AGE AND SEX

The age of the patients in our series varied from 45 to 73 years with an average age of 59.5 years. There was no apparent relation-

TABLE I.—SUMMARY OF CASES

Case Name	Age Sex	Duration	Urinary symptoms	Metastatic symptoms	Pathological diagnosis	Site of metastases	Type of bone lesion	End results
1 L.C.M.	73 M	6 yrs.	Hematuria Frequency	Pain in left clavicle	Papillary carcinoma	Left clavicle	No x-ray	Failing rapidly
2 L.C.H.	60 M	9 mos.	Frequency Nocturia Dribbling	Pain in sacro-iliac area	Papillary carcinoma	2nd and 4th lumbar vertebrae; lower dorsal vertebrae; sacrum	Osteolytic	Died
3 S.B.	50 F	2 yrs.	Hematuria Frequency	Pain in chest Pain in lower back	Papillary carcinoma	Rt. 9th rib; 3rd lumbar vertebra; rt. femur; pubic bones	Osteolytic	Died
4 M.T.	58 M	2 yrs.	Hematuria Frequency	Pain rt. hip Pain rt. thigh	Papillary carcinoma	Rt. and left pubic bones	Osteolytic	Died
5 M.A.C.	58 F	1 yr.	Hematuria Frequency	Pain rt. lower leg Swelling rt. lower leg	Papillary carcinoma	Right tibia; left tibia	Osteolytic	Bedfast and failing rapidly
6 T.G.T.	45 M	1½ yrs.	Hematuria	Pain left hip Pain left thigh	Papillary carcinoma	Left femur, left pubis, left ilium, left ischium	Osteolytic	Died
7 G.B.	61 F	1 yr.	Hematuria Frequency	Suprapubic pain	Papillary carcinoma	Right and left pubic bones	Osteolytic	Died
8 R.A.F.	53 M	9 yrs.	Hematuria Frequency	Pain lumbar spine and left leg	Papillary carcinoma	4th lumbar vertebra; left pubis	Osteolytic	Died

ship between the age at the onset of the symptoms and longevity. Geschickter stated that females are more prone to develop bone metastases than are males. This has not been our experience; in our series there were 5 males and 3 females.

TYPE OF BLADDER TUMOR

The primary tumors varied from small benign appearing papillomas to large ulcerating tumor masses. The size of the tumor apparently had little relationship to the formation of skeletal metastases. This is also noted by Nicholls who reported a case in which neither the primary bladder tumor nor the metastatic bone lesion showed evidence of malignancy though both were identical in type and structure. Rathbun and Kretschmer also had noted skeletal metastases secondary to small benign appearing primary tumors. In our cases the primary bladder neoplasm was papillary carcinoma.

In one case (Case 6) the bladder tumor had been treated by segmental resection. There was no evidence of tumor upon two cystoscopic examinations. The patient came to the hospital because of pain due to the skeletal metastases. In Case 8 the bladder was free of papillary tumor, but multiple small papillary tumors were found in the prostatic urethra.

URINARY SYMPTOMS

Hematuria was present in 7 of our 8 cases, and varied from slight intermittent bleeding to continuous bleeding with clot formation. In one case no statements relative to hematuria were noted in history. Frequency and nocturia, dysuria and pain were present in 7 of our 8 cases. Urinary symptoms lasted from 9 months to 9 years. In 4 cases the symptoms were present for less than 1½ years.

PAIN DUE TO METASTASES

In 2 instances (Case 2 and Case 6) pain due to the skeletal metastases was the symptom that brought the patient to the hospital. During the early course of the disease, the pain was described as rheumatic in type. The pain rapidly became severe and excruciating so that all of the patients required morphine for relief. In Case 5 of our series and in the case reported by Ingraham, surgery was performed on the skeletal metastases only to find that they were secondary to a bladder tumor. In the cases reported by Greenfield, Wells, and Copeland the symptoms due to the metastatic lesion was the first indication of the patient's illness.

ROENTGEN-RAY FINDINGS

In 7 of our 8 cases, the metastatic lesions were osteolytic in type. In 1 case (Case 1)

no roentgenogram was obtained. There was no evidence of new bone formation. The skeletal lesions were multiple in 6 cases. There were 5 instances of pathological fractures; 3 of these being compression fractures of a vertebrae, 1 being fracture of a rib; and 1 of a clavicle. In Case 2 the patient died 5½ months after roentgen-ray examination was made, and at autopsy almost the entire lumbar and lower dorsal spine was replaced by metastatic tumor. The distribution of the metastatic bone lesions was as follows: pelvis in 5 cases, lumbar spine in 3 cases, thoracic spine in 2 cases, ribs in 2 cases, femur in 2 cases, tibia and clavicle each in 1 case. In the cases in which there is involvement of the pelvis, the question may arise whether the carcinoma is due to metastases to the pubic bones or whether it is the result of a direct extension from the primary tumor.

TABLE II.—LOCATION OF BONE METASTASES IN 96 CASES

Location	Number	Remarks
Pelvis	56	Includes all bones of pelvic girdle
Lumbar vertebrae	23	14 cases with one vertebra involved
		7 cases with multiple vertebral involvement
		2 cases recorded as "spine" are included.
Thoracic vertebrae	4	
Femur	17	13 cases with one femur involved
		4 cases with both femurs involved.
Ribs	15	6 cases single rib involved
		9 cases multiple rib involvement
Tibia	10	9 cases with one tibia involved
		1 case both tibia involved
Sacrum	7	
Skull	5	
Humerus	4	2 cases one humerus involved
		2 cases both humeri involved
Scapula	4	2 cases one scapula involved
		2 cases both scapulae involved
Radius	3	
Foot	3	
Sternum	2	
Clavicle	1	
Acromial process	1	

MODE OF DISSEMINATION

Most authors at the present time are of the opinion that secondary lesions in the bones from primary carcinoma of the bladder occurs by way of the blood stream. Sutherland, Joll, Chute, Jenkinson, Piney, von Recklinghausen and many others are of the opinion that this is the only logical explanation. Schmidt's work has shown that metastatic blood borne emboli can pass the pulmonary barrier. He has shown minute, malignant emboli and small thrombi in the pulmonary arterioles which may remain latent with only occasional release of malignant cells into the systemic circulation. Piney believes that metastatic deposits in bones are due to arterial or capillary embolism. He has shown metastatic carcinoma cells in the blood vessels of the red bone marrow, and has also shown that there are no lymphatics in any part of the bone marrow.

Geschickter feels that there may be two routes: one via the nutrient blood vessels (medullary) and the other via the periosteal blood vessels and lymphatics (periosteal). He states that the medullary route gives rise to central destructive lesions whereas the periosteal route gives rise to a diffuse osteoplastic lesion. Kolodny believes that deviations of normal lymph flow by aberration of the lymph stream, retrograde flow, or reflex flow can lead to the spread of metastatic carcinoma cells throughout the skeleton.

DISCUSSION OF THE LITERATURE

A rather careful survey of the literature revealed a total of 105 cases of metastatic bone carcinoma secondary to carcinoma of the bladder. A large number of these cases were mentioned incidentally and without detail. In 38 reports which mentioned age, there were 2 cases in patients 34 years of age (Burkland and Leadbetter, and Gardner). The oldest patient was a 72 year old male reported by one of us (H.L.K.). The average incidence was 54.2 years. There were 35 males and only 5 females in 40 instances in which the sex was stated.

The largest group of cases of carcinoma of the bladder in the Carcinoma Registry of the American Urological Association occurred from 60 to 64 years. The next largest group showed the incidence to be from 55 to 59 years old.

Interesting is the fact that the age incidence in the cases culled from the literature with bone metastases was 54.2 years.

In the 38 cases in which the duration of the urinary symptoms was recorded, the average duration was 22.98 months before symptoms due to the bone metastases became manifest.

In Table II is listed the location of the bone metastases in the cases found in the literature.

SUMMARY

1. Bone metastases in carcinoma of the bladder occur more frequently than is generally appreciated.

2. Papillary carcinoma was the type of tumor in each case in our series.

3. In 1 case bone metastases were present although there was no evidence of bladder tumor at the time of entering the hospital.

4. In our series the type of bone lesion was osteolytic.

5. Bone metastases in bladder carcinoma occur reasonably early in the course of the disease.

6. It may be the cause of the first symptoms that bring the patient to the doctor.

7. Routine roentgen-ray examination in all cases of papillary tumors of the bladder may reveal the presence of bone metastases when least suspected.

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THE PLACE OF SURGERY IN THE EMERGENCY TREATMENT OF ACUTE MASSIVE, UPPER GASTROINTESTINAL HEMORRHAGE

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THE proper management of the patient with sudden massive bleeding from the upper gastrointestinal tract remains a most difficult problem for both surgeon and internist. Although, in the past, a few distinguished surgeons have advocated prompt intervention (2, 3), it is now generally agreed that it is better in the vast majority of cases to treat the patient expectantly in the hope that the hemorrhage will subside spontaneously (4, 5). The details of such management are not pertinent to the present discussion but in addition to other measures should always include the liberal use of blood transfusion. The aim of the surgeon is basically simple. He should operate only upon those patients who are bleeding to death despite medical treatment and transfusions. Unfortunately, the prompt and accurate selection of such patients is fraught with difficulty. The present paper is directed to a clarification of this aspect of the problem with particular reference to hemorrhage from peptic ulcer.

In dealing with upper gastrointestinal hemorrhage, one must not overlook the fact that the bleeding may be from a source not at present amenable to emergency surgery. The sources of hemorrhage in 191 patients admitted to the Peter Bent Brigham Hospital from January 1, 1940, through June, 1947, is shown in Table I. In nearly 25 per cent of the cases, the bleeding occurred from causes other than peptic ulcer or gastric neoplasm. Occasionally, one is faced with a patient who is apparently a candidate for emergency surgery but in whom the source of the bleeding is in doubt. Under such circumstances, it is our policy to transport the patient to the x-ray department for a swallow of barium and a fluoroscopic examination. A surgeon is in attendance and blood is immediately available for transfusion if not actually being given at the time. If this final diagnostic effort fails to disclose a surgical lesion, operation is withheld on the grounds that desperate as the situation appears, the patient's best chances will be under conservative management. Rarely in the presence of an appallingly, rapid rate of hemorrhage an exception to this rule may have to be made.

Assuming that the source of bleeding is reasonably clear, certain criteria for surgical intervention have been established by various writers (1, 3, 4, 5). Patients over the age of 50 are less likely to stop bleeding under conservative management than are younger patients. A first hemorrhage carries a higher risk than subsequent hemorrhages. The risk of death increases with the duration of hemorrhage so that after 72 hours have elapsed since onset, some surgeons refuse to intervene. As generalizations these statements are true but if rigidly applied to the individual patient, they may be highly misleading. In the present series 2 patients under the age of 45 bled to death (Table IV) and 2 of the 6 successful operations were performed over 72 hours after the bleeding started (Table VII). It is significant that in all but one of the fatal cases the hemorrhage was an initial one.

In analyzing the material it became evident that the one reliable criterion for prompt surgical intervention was not the amount or duration but the *rate of hemorrhage* and its effect upon the circulation. Accordingly, the cases have been divided into 4 groups arbitrarily designated as "moderate," "severe compensated," "severe uncompensated," and "exsanguinating." The criteria employed in this clas-

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TABLE I.*—THE CAUSES OF HEMORRHAGE FROM THE UPPER GASTROINTESTINAL TRACT

	Number	Perc ent of total
Duodenal ulcer	120	62.8
Gastric ulcer	15	7.9
Jejunal ulcer	6	3.1
Gastric neoplasm	5	2.6
Acute gastritis	17	8.9
Esophageal varices	14	7.4
Site undetermined	8	4.2
Miscellaneous	6	3.1
	191	100.0

*Readmissions of the same patient with the same source of bleeding are not included in this tabulation.

sification are: (1) the presence of syncope or shock as evidenced by sweating, fainting, cold clammy extremities, hypotension, and tachycardia, (2) the lowest hematocrit level recorded, and (3) the number of transfusions required to stabilize the circulation. Based upon these criteria, a rough estimate of the amount of blood lost may be made (Table VI).

A moderate hemorrhage is one in which the loss of blood ranges from 500 to 1,000 cubic centimeters. Such patients have melena or hematemesis and occasionally faint at the beginning of the illness, but they do not show evidence of syncope or hypotension when reaching the hospital. The hematocrit is above 30. Transfusions are rarely indicated. Emergency surgery is never indicated.

In group 2, "severe compensated," the loss of blood is serious, amounting to as much as a liter in 24 hours, but the rate of bleeding is sufficiently slow so that with the benefit of occasional transfusions, syncope, or collapse does not occur after the patient has entered the hospital and the circulation has become stabilized. Such patients may continue to bleed for several days as evidenced by bloody stools. They may develop azotemia and abdominal distention but they always maintain a good circulatory state. About 30 per cent of these patients require one or more transfusions. They are not candidates for emergency surgery.

TABLE II.*—MORTALITY OF HEMORRHAGE FROM PEPTIC ULCER

	Cases	Deaths	Mortality Per cent
Medical management	154	7	4.5
Surgical management	9	3	33.3
Hospital total	163	10	6.1

*In Tables II, III, and IV each hemorrhage is recorded. There were 163 hemorrhages in 141 patients.

TABLE III.—MORTALITY ACCORDING TO RAPIDITY OF HEMORRHAGE

Classification	Management	Cases	Deaths
Moderate	Medical	47	0
	Surgical	0	0
Severe compensated	Medical	73	1*
	Surgical	1	1
Severe uncompensated	Medical	26	0
	Surgical	2	0
Exsanguinating	Medical	8	6
	Surgical	6	2
		163	10

*Cor pulmonale

The patients in group 3, "severe uncompensated," are serious problems. They lose blood at a rate of a liter or a liter and a half in 24 hours and may continue to do so for several days. They not only have a history of syncope at the time of onset but usually are in shock at the time of admission. However, they respond well to transfusions and once stabilized by an initial transfusion of 1 or 2 liters do not again develop syncope or hypotension. They often continue to bleed steadily as evidenced by tarry stools, hematemesis, and a falling hematocrit but provided they are transfused at rates not exceeding 1500 cubic centimeters daily, they always appear to be in a good circulatory state. The indications for transfusions are continued bleeding but without a fall in blood pressure, weakness, faintness, sweating, or collapse. Although these patients recover without an emergency operation, they require the closest supervision by both internist and surgeon for, at any moment, the rate of bleeding may increase sufficiently to place them in the fourth or "exsanguinating" group of cases.

Under "exsanguinating hemorrhage" are placed those patients who not only have evidence of marked syncope and shock but who, after transfusions of a liter or two, fail to maintain a stable circulation despite continued transfusions of not more than 500 cubic centimeters every 8 hours. Characteristically these patients have repeated episodes of sweating, faintness, and hypotension despite liberal

TABLE IV.—MORTALITY ACCORDING TO AGE

Age in years	Entire series		Group 3 Severe uncompensated		Group 4 Exsanguinating	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
44 or less	63	2	9	0	5	2
45–49	26	0	7	0	1	0
50 or more	74	8	12	0	8	6
All ages	163	10	28	0	14	8

TABLE V.—MORTALITY OF COMBINED GROUPS OF SEVERE UNCOMPENSATED AND EXSANGUINATING HEMORRHAGE

Management	1940 through 1945		Jan. 1946 through June 1947	
	Cases	Deaths	Cases	Deaths
Medical	22	5	12	1
Surgical	4	2	4	0
	26	7	16	1

transfusions. There may be sharp falls in the hematocrit despite transfusions but signs of syncope or shock are of more value than the exact level of the hematocrit. Repeated hematemeses and uncontrollable pain are often valuable contributory signs, but these may be absent and are of less significance than syncope. The one reliable finding is failure to maintain a stable circulation despite transfusions which amount to about 500 cubic centimeters every 8 hours. It is our belief that these are the patients upon whom surgery must be employed.

It is obvious that in classifying patients according to this scheme, experience and sound clinical judgment are of the greatest importance. Although a rate of hemorrhage of over 500 cubic centimeters in 8 hours has been set as the dividing line between a severe uncompensated and an exsanguinating hemorrhage, the actual amount of loss is of less importance than the patient's reaction to it. *Recurrent syncope is the most valuable single sign.* In appraising these patients, the closest co-operation between medical and surgical services is necessary. It is recommended that a bedside team of internist and surgeon follow, from the moment of hospitalization, every patient in whom emergency surgery may be considered.

The mortality from bleeding peptic ulcer at the Peter Bent Brigham Hospital for the last 7½ years is shown in Table II. During this period there were 163 patient admissions for this complaint, representing 141 individual patients. (Each hemorrhage has been included in computing the mortality. If a patient bleeds at widely separated intervals, in different hospital admissions, each episode must be regarded as a separate and distinct risk to life.) Of the 163 hemorrhages, 137 were from duodenal ulcer with 6 deaths, 15 were from gastric ulcer with 4 deaths, 9 were from jejunal or marginal ulcer, and 2 from a combination of gastric and duodenal ulcer. There were 125 males and 38 females, and in 74 instances, or roughly 45 per cent, the age of the patient was 50 years or more. Under medical management there were 7 deaths in 154 cases, 4.5 per cent. Among the 9 patients undergoing emergency operation, there were 3 deaths. The hospital mortality rate was 6.1 per cent.

A somewhat different picture is obtained when the cases are classified according to the severity of the hemorrhage (Table III). It can be seen that 8 of the 10 deaths occurred in the "exsanguinating" group. The 2 deaths in the "severe compensated" group were not solely the result of hemorrhage. In the medical case, a comparatively small hemorrhage was the final precipitating cause of death in a patient with severe cor pulmonale. The surgical death in this group occurred as a consequence of an operation which by our present standards was ill advised, and was carried out without adequate preoperative preparation. Two points are obvious: the fatal hemorrhages are of the rapid or "exsanguinating" type and in this group the results of surgery are at least as good if not better than medical management. It is our opinion based on a review of the records that the surgical recoveries represent pure salvage, that is, the patients would not have recovered without operation. Moreover, among the patients who died under medical management, there are several who in retrospect appear to have been better risks for surgery than some of the patients in whom successful operations were performed.

Table IV analyzes the age factor and deaths in the entire series, in the "severe uncompensated" and in the "exsanguinating" groups.

TABLE VI.—A CLASSIFICATION OF CASES ACCORDING TO SEVERITY OF THE HEMORRHAGE

	Syncope or shock in hospital	Hematocrit (or equivalent)	Transfusion	Estimated rate of blood loss
Moderate	None or slight	31+	No	500 cc. ± Total
Severe "compensated"	None or slight	30 or less	Frequent (30%)	500–1000 c.c. per 24 hrs.
Severe "uncompensated"	Marked	30 or less	Usual (90%): response good	1000-1500 c.c. per 24 hrs.
Exsanguinating	Profound; ± recurrent	30 or less	Massive: response uncertain	1500 c.c.+ per 24 hrs.

Although there is a higher proportion of deaths in patients 50 years of age or more, it is less pronounced than might be expected in the more serious bleeders; in exsanguinating hemorrhage considered alone there were 2 deaths in 5 patients under 45, and 6 deaths in 8 patients 50 or more. The point to bear in mind in connection with older patients is that they are more likely to develop an exsanguinating hemorrhage than younger patients. An apparently mild hemorrhage in an older patient deserves closer watching on this account. But older patients who do not have an exsanguinating hemorrhage have just as good a chance to get well on conservative management as the younger ones. To put it another way, the fact that a patient is over 50 years of age is not an indication for prompt surgery. Indeed, quite the contrary, the older the patient the more desirable it is to avoid unnecessary surgery. But old age is a warning that there is greater danger of an exsanguinating hemorrhage. If *it develops*, surgery is necessary regardless of age. Thus, the operative indication is not the age of the patient but the rate of the bleeding.

There is one type of patient for whom immediate surgery should be considered even though the hemorrhage is thought not to be exsanguinating. Every clinic has patients being followed medically for peptic ulcer who have bled in the past and in whom one more hemorrhage will be sufficient cause to recommend interval surgery. If such a patient should present himself in good condition within a few hours of the onset of a hemorrhage, a strong point can be made out for transfusion and immediate operation, not only to check the bleeding, but also to provide the corrective subtotal gastric resection. This combines, as it were, the otherwise separate risks of the hemorrhage and the interval operation. If such a patient is seen late in the course of a

TABLE VII.—OPERATIONS FOR ACUTE HEMORRHAGE FROM PEPTIC ULCER
Peter Bent Brigham Hospital—January, 1940 to July, 1947

Year	Age Sex	Group	Site	Duration pre-operative	Blood pre-operative	Blood at operation	Procedure	Result and comment
July '42	65 M	Exsanguinated	D	84 hrs.	2,000	2,000	Direct ligation	Recovery
July '43	53 M	Severe compensated	D	8 days	500	500	Gastric resection	Death on table. Inadequate preoperative preparation
Oct. '44	58 M	Severe compensated	G	96 hrs.	800	1,000	Gastric resection	Recovery
Nov. '44	68 M	Exsanguinated	G	15 hrs.	3,500 +1000 Pl		Gastric resection	Death first postoperative day
Sept. '45	24 M	Exsanguinated	D	54 hrs.	2,500	9,500	Gastric resection	Death on table. Sympathectomy for hypertension 6 months ago
May '46	37 M	Exsanguinated	G	18 hrs.	1,500	1,000	Gastric resection	Recovery. Ulcer perforated 5 days previously
Aug. '46	73 M	Exsanguinated	G	24 hrs.	2,000	2,500	Gastric resection	Recovery
Nov. '46	73 M	Severe uncompensated	D	42 hrs.	500 750 Pl	500	Gastric resection	Recovery
Dec. '46	45 M	Exsanguinated	G	12 hrs.	2,000	2,000	Gastric resection	Recovery

hemorrhage, it is wiser to apply the previously mentioned criteria for operation.

It is beyond the scope of this study to deal with the technical features of operation. A resection of the ulcer and subtotal gastric resection should be carried out if possible. It was the procedure employed in 8 of the 9 surgical cases in this series (Table VII).

For the past 18 months the line of treatment indicated by this study has been practiced. All of the patients were followed by a "bedside team" of internist and surgeon. Those patients who showed no evidence of syncope or shock in the hospital were not considered candidates for emergency operation. Patients who were in shock on arrival at the hospital or who developed evidence of syncope while in the hospital were regarded as potentially in danger of requiring an operation to stop the bleeding. In such cases the pulse and blood pressure were taken at 15 minute intervals and recorded on a chart. Depending upon the apparent need, an initial whole blood transfusion of 500 to 1000 cubic centimeters was given and the subsequent course of the bleeding observed. If it continued as evidenced by melena, hematemesis, or a continued fall in the hematocrit and hemoglobin, transfusions were repeated at a rate of not more than 500 cubic centimeters every 8 hours. Even though some patients continued to bleed for several days, operation was withheld as long as syncope or hypotension did not recur. The loss of blood was replaced by daily transfusions of 500 to 1500 cubic centimeters. However, if syncope or hypotension developed despite transfusions of 500 cubic centimeters every 8 hours, it was regarded as evidence that the *rate of bleeding* made surgical intervention imperative. Accordingly, the rate of transfusion was increased and as soon as the circulation was stabilized operation was performed. Usually the transfusions were continued until the bleeding was controlled surgically.

During this period there were 11 patients with severe uncompensated hemorrhage and 5 with exsanguinating hemorrhage. Seven of the patients were over 50 years of age. There was 1 death—a patient who died enroute to the ward, before effective treatment could be started. There were 4 operations, all resections of the ulcer with subtotal gastric resection, 2 in patients over 70. Although the series is small, the results are sufficiently better than those of the preceding 6 years, in which there were 7 deaths in 26 patients, to suggest that this plan of management has merit (Table V).

It is our view that there is no conflict between "medical" management as opposed to "surgical" management. The surgeon should stand ready to *supplement* conservative management in appropriate cases. In this light, direct comparison of medical and surgical mortality rates is without meaning, for the surgeon will be operating only upon patients expected to die without operation. The surgical mortality will necessarily exceed that of medical management, and may indeed appear prohibitive when examined alone, but each patient surviving operation will then represent pure salvage and the hospital mortality will be reduced.

SUMMARY

The experience with acute hemorrhage from peptic ulcer at the Peter Bent Brigham Hospital from January 1, 1940, through June, 1947, is reviewed. A clinical classification of such patients is presented, based upon the presence or absence of shock, the lowest hematocrit level recorded, and the estimated rate of bleeding. The principal indication for emergency operation is not the amount but the *rate of bleeding* as evidenced by recurrent syncope or shock after the circulation has once been stabilized by transfusion and despite continued transfusions at an average rate of not more than 500 cubic centimeters every 8 hours.

A plan of management for these cases is presented and the results are recorded.

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FIVE YEAR END-RESULTS OF IRRADIATION THERAPY OF CANCER OF THE CERVIX UTERI AT THE MEMORIAL HOSPITAL

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A REPORT of the five year end-results in 1,072 cases of primary carcinoma of the cervix in patients treated at Memorial Hospital during the period of 1934–1941 inclusive follows. These data were compiled for publication by the League of Nations Health Organization in its first report since 1941. In that year its last report presented a statement of results obtained in 1933 and previous years with radiotherapy in cancer of the uterine cervix at 17 different institutions in the United States, the British Isles, and the continent of Europe. Further collection of data was interrupted by the war, but this is now being resumed under the editing direction of Professor J. Heymann of the Radiumhemmet in Stockholm.

The data in the tables in this paper are presented in the manner required by the League of Nations Health Organization. Only patients with cancer of the cervix uteri (including primary carcinoma of the stump) are included and these are instances in which the treatment carried out was entirely radiological. Only primary cases are included; patients having recurrent cancer following radiological treatment elsewhere are omitted. Precancerous conditions are excluded as are also sarcomas and malignant mixed tumors. All patients examined, whether treated or not, are included. Notation is made of those patients lacking microscopic verification of disease. To be classified as "cured" the patient must be alive after 5 years or more and free from evidence of disease after treatment. Other requisites of the organization are made but the above are the essential ones.

It was felt that these figures, comprising a large series of patients (1,072), should be made available to American readers simultaneously with their presentation to the League of National Health Organization for publication. The data also suggest further discussion of the treatment of cervix carcinoma.

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METHODS OF TREATMENT

Treatment during these years involved different techniques of external roentgen therapy together with a fairly constant method of radium application to the uterus. There was the "massive dose technique" of pelvic roentgen therapy in which the patient received 750 roentgens at a single treatment to each of four pelvic fields, 50 centimeter target-skin distance, 200 kilovolts, 0.5 millimeter copper filtration. Also there was the "divided dose technique" in which the patient received 12 treatments of 200 roentgens each to each of six fields, 70 centimeter target-skin distance, 200 kilovolts, 0.5 millimeter copper filtration. The "pyramidal dose" technique was a variation of the latter in which the number of roentgens per treatment was gradually increased. The superiority of the "divided dose technique" became evident after comparative study of the two methods (1).

External roentgen therapy was the supplement to radium application to the uterus in the form of a "cervix tandem" to deliver 3,000 milligram hours of radium within the cervix and also by means of a vaginal "bomb" applicator to deliver 1,500 milligram hours against the cervix.

RESULTS

As already mentioned, the tables are presented in the form in which they are submitted to the League of Nations Health Organization.

Table I presents the total number of patients with primary cancer examined in these

TABLE I.—PATIENTS EXAMINED AT THE CLINIC

1	2	3		4	5	6	7	8	9	10	11
Year	Total number of patients examined with a view to treatment	Patients examined at clinic—but not treated		Not accepted for radiological treatment:				Accepted for radiological treatment but not treated. Reasons:			
		No.	%	Operation advised	Lack of accommodations or therapeutic facilities	Unsuitability—general condition, extent of disease, etc.	Other specified reason	Refusal by patient	Prevented by death or disease	Sought treatment elsewhere	Unknown
1934	149	3	2.0	0	0	2	1	0	0	0	0
1935	140	2	1.4	0	0	2	0	0	0	0	0
1936	142	7	4.9	0	0	5	2	0	0	0	0
1937	147	8	5.4	0	0	6	0	2	0	0	0
1938	117	4	3.4	0	0	4	0	0	0	0	0
1939	125	4	3.2	0	0	2	2	0	0	0	0
1940	127	1	0.8	0	0	1	0	0	0	0	0
1941	125	6	4.8	2	0	2	1	1	0	0	0
Total	1072	35	3.3	2	0	24	6	3	0	0	0

years with further division into those treated and those not treated. Of the 1,072 patients examined 96.7 per cent, or 1,037, were treated. Reasons for nontreatment are stated.

Table II presents the total number of patients treated in each year with breakdown into the four stages of the League of Nations anatomical classification. It is interesting to note that in the early years of this series the greater proportion of patients were in the more advanced stages of disease and that this situation tended to reverse itself in the later years. This presumably represents the increasing "cancer consciousness" of the lay public and referring physician. This breakdown into stages undoubtedly incorporates some degree of error since it was necessary in compiling these statistics to change the old method of classification used at Memorial Hospital to that system suggested by the League of Nations. This possible error also effects the results of cures according to the different stages and will be mentioned again when the last four tables are discussed.

TABLE II.—PATIENTS RADIOLOGICALLY TREATED

1	2	3		4		5		6		7	
Year	Total number of patients treated stages I–IV	Stage I		Stage II		Stage III		Stage IV		No. of cases without microscopic verification	
		No. of cases	%	No. of cases	%	No. of cases	%	No. of cases	%	No.	%
1934	146	13	8.9	34	23.3	99	67.8	0	0.0	0	0.0
1935	138	17	12.3	39	28.3	76	55.1	6	4.3	2	1.4
1936	135	25	18.5	35	26.0	69	51.1	6	4.4	2	1.4
1937	139	26	18.8	37	26.5	65	46.8	11	7.9	4	2.8
1938	113	13	11.5	52	46.0	45	38.8	3	2.7	3	2.7
1939	121	35	29.0	45	38.1	36	29.8	5	4.1	2	1.6
1940	126	41	32.5	49	39.0	28	22.2	8	6.3	0	0.0
1941	119	30	25.1	48	40.4	36	30.3	5	4.2	0	0.0
Total	1037	200	19.3	339	32.7	454	43.7	44	4.3	13	1.2

TABLE III.—RESULTS OF TREATMENT

1	2	3						4						5						6						7					
Year	No. of patients treated	Alive without evidence of the disease after a period of observation of (years)						Alive but not cured after a period of observation of (years)						Died of cancer during a period of observation of (years)						Lost sight of during a period of observation of (years)						Died of intercurrent disease during a period of observation of (years)					
		5	6	7	8	9	10	5	6	7	8	9	10	5	6	7	8	9	10	5	6	7	8	9	10	5	6	7	8	9	10
1934	146	43	39	37	33	30	28	2	2	2	1	1	1	82	83	84	86	87	87	12	14	15	16	17	18	7	8	8	10	11	12
1935	138	30	28	26	23	19	17	2	2	1	1	1	0	88	88	90	92	94	95	11	12	13	14	15	16	7	8	8	8	9	10
1936	135	37	35	34	32	30	28	4	2	1	0	0	0	85	89	90	91	91	92	7	7	8	10	11	11	2	2	2	2	3	4
1937	139	42	40	39	37	35		0	0	0	0	0		88	88	88	89	89		8	9	10	11	12		1	2	2	2	3	
1938	113	32	30	26	26			2	2	2	1			66	67	68	68			10	10	11	12			3	4	6	6		
1939	121	41	40	38				1	1	0				72	73	74				7	7	8				0	0	1			
1940	126	39	33					2	2					72	73					11	14					2	4				
1941	119	33						0						77						5						4					
Total	1037	297						13						630						71						26					

Table III presents the number of patients alive without evidence of disease after a period of observation of at least 5 years and also those alive after this time but not cured. Columns 6 and 7 in this table contain those patients lost for follow-up examination and those who died from some other cause; both latter types of patient were considered *not* cured in computing 5 year end-results.

Table IV presents the overall end-results for at least 5 years without breakdown into stages of extent of cancer. It is the most important table. The absolute cure rate (column 5) is computed on cures per total number of patients examined regardless of whether or not treatment was given. The relative cure rate (column 6) is based on cures per total number of patients actually treated. For the 1,037 patients in all 4 stages actually treated the 5 year overall relative cure rate was 28.6 per cent.

In examining the relative cure rate by years, one is immediately struck by the maintenance of an almost constant level of overall cure rates for these 8 years. There was no tendency for them to rise. This "plateau" tendency prevailed in spite of some increase of patients with the earlier stages of the disease.

TABLE IV.—STAGES I—IV—EVALUATION OF RESULTS

1	2	3	4						5						6					
Year	Total no. of patients examined with a view to treatment	Number of patients treated	Alive without evidence of the disease after a period of observation of (years)						Absolute cure rate at end of (years)						Relative cure rate at end of (years)					
			5	6	7	8	9	10	5	6	7	8	9	10	5	6	7	8	9	10
1934	149	146	43	39	37	33	30	28	28.8	26.2	24.9	22.1	20.1	18.7	29.3	26.7	25.4	22.6	20.5	19.2
1935	140	138	30	28	26	23	19	17	21.4	20.0	18.6	16.4	13.6	12.0	21.7	20.3	18.9	16.7	13.9	12.3
1936	142	135	37	35	34	32	30	28	26.1	24.6	23.9	22.5	21.1	19.7	27.4	25.9	25.2	23.7	22.2	20.7
1937	147	139	42	40	39	37	35		28.6	27.2	26.5	25.2	23.8		30.2	28.8	28.0	26.6	25.2	
1938	117	113	32	30	26	26			27.4	25.7	22.2	22.2			28.3	26.6	23.1	23.1		
1939	125	121	41	40	38				32.8	32.0	30.5				33.8	33.0	31.4			
1940	127	126	39	33					30.8	26.0					31.0	26.2				
1941	125	119	33						27.0						28.0					
Total	1072	1037	297						27.7	%					28.6	%				

TABLE V.—STAGE I—EVALUATION OF RESULTS

1	2	3						4					
Year	Number of patients treated in stage I	Alive without evidence of the disease after a period of observation of (years)						Relative cure rate after a period of observation of (years)					
		5	6	7	8	9	10	5	6	7	8	9	10
1934	13	7	6	6	6	6	4	53.9	46.2	46.2	46.2	46.2	30.8
1935	17	8	8	8	7	7	7	47.1	47.1	47.1	41.2	41.2	41.2
1936	25	13	13	13	13	13	12	52.0	52.0	52.0	52.0	52.0	48.0
1937	26	16	15	15	15	15		61.9	57.7	57.7	57.7	57.7	
1938	13	8	7	6	6			61.5	53.8	46.1	46.1		
1939	35	16	15	14				45.7	42.9	40.0			
1940	41	23	20					56.0	49.0				
1941	30	15						50.0					
Total	200	106						53.0%					

Tables V, VI, VII, and VIII present the relative cure rate by extent of disease, according to the League of Nations anatomical classification, stages I, II, III, and IV, respectively. The decrease in cure rate with increase in extent of disease is obvious. No stage IV patient was ever "cured." The data show a rather striking uniformity of results obtained between the years 1934 and 1941, i.e. 52 to 62 per cent for stage I (with the exception of 2 years when the results were 47.1 and 45.7 per cent. For the 200 stage I cases in which patients were treated over the 8 year period the relative cure rate was 53.0 per cent (Table V). The apparent peaks in 1937 and 1938 lose significance when it is noted that only 39 stage I patients were treated in these 2 years. For stage II the results were 24 per cent to 30 per cent except for 3 years when the results were 41.2 per cent, 40.4 per cent, and 42.2 per cent, respectively. The significance of these years in which better results were obtained is lessened by the fact that they were not obtained at the end of the period studied and thus do not indicate consistent improvement in method. Instead, these good years occur irregularly throughout the 8 year period. In the last 2 years the stage II results were 24.5 per cent and 28.8 per cent, respectively, whereas in 1935 and 1936 they were 30.8 per cent and 34.3 per cent, respectively. For stage III the relative cure rate varied from 6.7 per cent in

TABLE VI.—STAGE II—EVALUATION OF RESULTS

1	2	3						4					
Year	Number of patients treated in stage II	Alive without evidence of the disease after a period of observation of (years)						Relative cure rate after a period of observation of (years)					
		5	6	7	8	9	10	5	6	7	8	9	10
1934	34	14	14	14	12	10	10	41.2	41.2	41.2	35.3	29.1	29.1
1935	39	12	11	10	10	8	7	30.8	28.2	25.6	25.6	20.5	18.0
1936	35	12	12	12	11	10	10	34.3	34.3	34.3	31.4	28.6	28.6
1937	37	9	8	8	8	8		24.3	21.6	21.6	21.6	21.6	
1938	52	21	20	18	18			40.4	38.5	34.6	34.6		
1939	45	19	19	18				42.2	42.2	40.0			
1940	49	12	10					24.5	20.4				
1941	48	13						28.8					
Total	339	112						33.1%					

TABLE VII.—STAGE III—EVALUATION OF RESULTS

1	2	3						4					
Year	Number of patients treated in stage III	Alive without evidence of the disease after a period of observation of (years)						Relative cure rate after a period of observation of (years)					
		5	6	7	8	9	10	5	6	7	8	9	10
1934	99	22	19	17	15	14	14	22.2	19.2	17.2	15.2	14.1	14.1
1935	76	10	9	8	6	4	3	13.2	11.9	10.5	7.9	5.3	3.9
1936	69	12	10	9	8	7	6	17.1	14.5	13.1	11.6	10.1	8.7
1937	65	17	17	16	14	12		26.2	26.2	24.6	21.5	18.5	
1938	45	3	3	2	2			6.7	6.7	4.7	4.7		
1939	36	6	6	6				16.7	16.7	16.7			
1940	28	4	3					14.4	10.7				
1941	36	5						14.0					
Total	454	79						17.4%					

1938 to 22.2 per cent in 1934 with an 8 year average for 454 stage III patients treated of 17.4 per cent.

We have not attempted to draw much significance from the fact that some years gave relatively high or low cure rates for individual stages for two other reasons: first, the number of patients in each stage per year is not large enough to be statistically significant; second, in compiling these statistics it was necessary to reclassify into League of Nations stages I–IV the old Memorial Hospital classification of "early," "borderline," and "advanced." Since the two types of classifications varied somewhat when compared, the reclassification had to be made from descriptions on the patients' charts of the extent of disease. In most cases these descriptions were adequate to permit accurate reclassification. Obviously, however, any such method of classification not made at the time of initial examination of the patient would tend to introduce some error into the breakdown of cases and statistics for individual stages. These objections cannot be raised against the figures in Table IV.

Most obvious in the study of these statistics is the "plateau tendency" of the overall cure rate in Table IV. No more patients were being saved in 1941 than in 1934. Although differential study within this series had established relative superiority of "divided dose technique" of external roentgen therapy over

TABLE VIII.—STAGE IV—EVALUATION OF RESULTS

1	2	3						4					
Year	Number of patients treated in stage IV	Alive without evidence of the disease after a period of observation of (years)						Relative cure rate after a period of observation of (years)					
		5	6	7	8	9	10	5	6	7	8	9	10
1934	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
1935	6	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
1936	6	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
1937	11	0	0	0	0	0		0.0	0.0	0.0	0.0	0.0	
1938	3	0	0	0	0			0.0	0.0	0.0	0.0		
1939	5	0	0	0				0.0	0.0	0.0			
1940	8	0	0					0.0	0.0				
1941	5	0						0.0					
Total	44	0						0.0					

"massive dose technique," it became apparent that radiotherapy in cancer of the cervix had reached a maximum level of efficiency beyond which it was not advancing. In 1943, in search of improved methods of irradiation technique, a comparative study of the use of vaginal cone roentgen therapy and parametrial radon needles was begun; a preliminary report of this study was made by Taylor and Twombly in 1946. In 1945 radical hysterectomy was instituted for the treatment of selected early cases of cancer of the cervix uteri by Taylor.

DISCUSSION

It has been the purpose of this paper to present the 5 year end-results in 1,072 patients with cancer of the cervix seen at Memorial Hospital in the period 1934–1941 inclusive. The 5 year overall cure rate for the 1,037 patients treated by irradiation was 28.6 per cent.

The conclusion to be drawn from these studies is that there appears to be little consistent amelioration in results of the management of carcinoma of the cervix during the years studied. A perusal of reports concerning the results of irradiation therapy for carcinoma of the cervix carried out in widely scattered centers leads to a similar impression. It therefore follows that the question must be raised as to whether or not the exclusively radiotherapeutic management of cervix carcinoma should continue to be pursued without some form of combination with surgical attack. The continued repetition in standard texts, even of recent date, that radical hysterectomy for cervix carcinoma is accompanied by a high mortality rate has been a strong influence in discouraging surgical attempts in this field. However, Meigs has shown that modern surgical effort in an appreciable series of selected patients should not entail significant mortality and therefore the argument of mortality does not now have the force which it did two decades or more in the past.

The problem is not one of irradiation therapy *versus* surgery; it is: what can be done to increase progressively the incidence of cure in carcinoma of the cervix uteri?

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EDITORIALS

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ANGIOCARDIOGRAPHY

ANGIOCARDIOGRAPHY is the roentgenographic examination of the heart and great vessels following the intravenous injection of radio-opaque material. The first extensive use of the procedure was reported, in infants by Castellanos, Garcia and Pereiras, and in adults by Robb and Steinberg. It has been applied by the present writer and his associates in nearly 1500 cases comprising well over 2,000 injections, without any serious untoward results. Reactions to the procedure ordinarily are mild and have completely subsided in a few minutes. Rarely, a transient, shock-like state occurs. To minimize the frequency of this occurrence, patients are carefully screened to exclude those with definite allergic tendencies and those suffering from any condition in which a rapid drop in blood pressure might not be tolerated. Severe liver or kidney damage are also contraindications. Furthermore, individual sensitivity to the radio-opaque material is tested by the preliminary injection of a small amount.

Successful angiocardiography depends upon a well integrated team of workers. The radio-opaque material, 40 to 50 cubic centimeters of 70 per cent diodrast in adults and amounts in proportion to body weight in children, must be injected as rapidly as possible. For the roentgen procedure the author currently uses an arrangement which permits exposures to be made as fast as two per second. In other cases, an exposure is made at every heart beat in preset phases of the cardiac cycle. He also employs motion picture photography of the fluoroscopic screen. On the other hand Temple, Steinberg, and Dotter make successive photographs of the fluoroscopic screen on 70 millimeter film.

The major value of angiocardiography to the clinician resides in the delineation of the anatomy of the heart and great vessels. When the injection is successful, there are visualized successively, the superior vena cava, the right auricle, the right ventricle, pulmonary artery and its branches, the pulmonary veins, left auricle, left ventricle, the aorta and the branches of this vessel arising from the arch. In many children, and in the occasional adult, one or more of the coronary arteries have been seen. Mediastinal tumor, therefore, is usually easily differentiated from aneurysm since the latter fills with the opaque material along with its vessel of origin. An aneurysm which is largely filled with clot will not become opaque but the diagnosis of an aneurysm may be suggested by evidence of disease in other segments of the aorta.

The alteration in the pulmonary vascular pattern in various thoracic diseases was described by Robb and Steinberg. They refer to pressure on and displacement of the hilar

vessels by enlarged glands. They observed these changes both in primary and secondary tumors of the mediastinum as well as in tuberculosis. In pulmonary tuberculosis they describe changes in the pulmonary circulation which fall into three main types. These are diminished vascularity resulting from the narrowing and obliteration of blood vessels in exudative tuberculosis and from fibrosis in the productive type, gross displacement of the intrathoracic cardiovascular structures by extensive pulmonary fibrosis, and displacement and stenosis of the pulmonary artery by tuberculous adenitis. In tuberculous fibrosis, emphysema, chronic pulmonary suppuration, and pulmonary cyst or neoplasm there is a decrease in the vascularity of the involved regions, while in other portions there appears to be an increase in size and number of blood vessels.

Our own interest has been chiefly in lung cancer. Here we have found that an infiltrative tumor distorts, compresses, and occludes the vessels in the area of involvement. When the tumor is located near to a large branch of the pulmonary artery, this branch is likely to be partially or completely occluded. In the presence of a circumscribed tumor which is not invasive even though malignant, the vessels are displaced and compressed but are not ordinarily occluded. Angiocardiography may be of diagnostic value, therefore, when bronchial neoplasm is suspected but is not proven even by bronchoscopy. Enlarged mediastinal nodes may be indicated by pressure on the large vessels but neoplastic infiltration cannot be assumed unless there is distinct irregularity in outline. The point of obstruction in mediastinitis and in certain instances of restrictive pericarditis also can be visualized as well as the collateral circulation.

Recent advances in the surgery of congenital abnormalities in the cardiovascular system have pointed up the usefulness of angiocardiography. Thus the site and extent of coarctation of the aorta can be shown as well as the presence of an associated aneurysm. We have been impressed with the frequency of what we have called atypical coarctation in which the aorta does not show the usual uniform and progressive diminution in size but is characterized by constricted segments alternating with dilated areas. Presumably, these are variations of coarctation but the constriction is not of sufficient degree to disturb the dynamics of the circulation. On the other hand, an associated constriction of a major vessel such as the subclavian artery, which is frequently demonstrated on the angiocardiogram, may be clinically manifest.

An alteration in the outline of the proximal descending aorta is found regularly in the presence of ductus arteriosus but this does not necessarily indicate patency. In most cases, according to the observation of A. S. W. Touroff made at operation, this probably represents a local fusiform dilatation of the aorta but in some cases it might be a traction aneurysm or the outline of the infundibulum of the ductus. When a large shunt is present, the pulmonary artery is revisualized. In the tetralogy of Fallot the anatomical features of pulmonic stenosis and right ventricular hypertrophy are shown and, in addition, the shunting of diodrast from the right ventricle into the overriding aorta and into the left ventricle. The size of the pulmonary artery can ordinarily be made out but failure to visualize this vessel does not necessarily indicate pulmonary atresia. The position of the aortic arch and its branches also is useful preoperative information. In the Eisenmenger complex, there is a similar appearance but without pulmonic stenosis and with a dilated pulmonary artery. In this condition, there is less of a venous arterial shunt so that although the aorta is

visualized simultaneously with the pulmonary artery, it is not as dense as in the tetralogy.

We need not here detail the findings in other congenital lesions. Suffice it to say that the combination of an accurate history, careful physical examination, electrocardiography, and when necessary the application of such special techniques as cardiac catheterization, angiocardiography, and microplethysmography permit a complete anatomic and physiologic diagnosis in most cases. The same combination of procedures has added immeasurably to our understanding of the altered cardiac dynamics found in normal subjects during exercise and in those with right ventricular strain due to mitral disease and pulmonary insufficiency. We may confidently anticipate that the continued integrated use of these methods will inevitably increase our understanding of, and diagnostic acumen in, cardiovascular disease.

MARCY L. SUSSMAN.

IS THERE AN ADEQUATE THERAPY FOR REGIONAL ENTERITIS?

ALTHOUGH surgery at present offers the best opportunity for palliation and control of regional enteritis, an extensive experience with this disease at the Beth Israel Hospital in Boston indicates that the end-results of any and all treatment leave much to be desired. Many of the questions raised when the disease first became generally familiar are still unanswered. For instance, we do not know whether the disease is an infection, a nutritional deficiency disease or a psychosomatic disorder. As surgeons we stand in regard to this disease in a worse position than we do with ulcerative colitis because colectomy can provide a final and definitive cure for ulcerative colitis, while excision of the involved bowel in regional enteritis frequently does not. It has recently been stated that if all inflamed loops of small bowel are not removed, recurrence or inadequate control of the disease is the result. But the fact is that recurrence may result even if all the inflamed loops are removed.

The frequent occurrence of unsatisfactory end-results following surgery naturally brings up the matter of nonsurgical treatment. What is the medical treatment of regional enteritis and what does it have to offer? The medical treatment of regional enteritis aims at improving and maintaining nutrition, correcting anemia and relieving pain and diarrhea. A high vitamin, high protein, high carbohydrate, low residue diet with liver, iron, and calcium supplements, and the judicious use of sedatives and antispasmodics and of chemotherapy are the chief therapeutic measures available. Finally, since many patients with this disease have psychosomatic difficulties, psychotherapy is also thought by some to be helpful.

How effective is medical management? The earliest form of the disease is occasionally encountered as an unexpected finding in patients operated on for right lower quadrant pain. Some of these patients have recovered without further therapy of any kind. Some have not. Some of those who have had medical care have become well sooner or later and have avoided surgery. It is impossible to tell whether arrest of the disease was achieved because of the medical therapy given, but all are agreed that spontaneous arrest does occur. This being so, no patient should be subjected to surgery simply because he is known to have the disease. The symptoms must be disabling and must have failed to yield to the best medical treatment, because surgery is certainly not a completely reliable therapy, whatever the stage of the disease with which one is dealing. It is pertinent to inquire whether the best medical treatment as here described can still be im-

proved? Possibly. The intestinal antibiotics have not been sufficiently exploited. Massive local and parenteral chemotherapy is sometimes accompanied by at least temporary improvement, so striking as to be hardly coincidental.

The need for surgery in a substantial percentage of patients will be unavoidable because of the intensity of suffering or the speed of deterioration or both. Whether we are adherents of one or another form of therapy, abscess, fistula, organic stricture or hemorrhage will compel surgery. But what has surgery to offer patients without these complications? The picture is not too bright despite many optimistic reports by surgeons. It is stated in a paper published in 1945 that resection in chronic terminal ileitis was satisfactory in 35 of 44 cases followed for over one year. It is important to point out that a satisfactory result for one year is no more a test of cure of regional ileitis than it is of cancer of the breast. We have recently had a patient who was well for fifteen years after a resection for regional enteritis and who then developed extensive recurrence which required a second resection. We could cite many similar cases of recurrence years after what appeared to be an adequate resection. Everyone knows, however, that removal of all the visibly involved bowel is not equivalent to complete eradication of all diseased tissue because the involved lymph gland area is far more extensive than the involved bowel. One might ask whether it is desirable or possible to remove all lymph nodes? That it is desirable is questionable; that it is possible is almost certainly not the case because even the nodes which are not palpable may also be involved. Recurrence is not uncommon in the glands as well as in the bowel considerably proximal or distal to an anastomosis performed in an area free of disease. So it is not surprising that some authorities now conclude that resection is best avoided and that a defunctioning ileocolostomy is preferable. But is great confidence justified in a defunctioning ileocolostomy? A review of what has happened to the patients who have had this procedure fails to support the optimistic view of its proponents We have seen patients in whom ileocolostomy and exclusion failed completely to protect against further spread of the disease, which in some cases ultimately involved most of the small intestine. Nor did subsequent extensive intestinal resection with a new anastomosis between normal loops of bowel succeed in restoring some of these patients to good health. Regional enteritis may not only progress proximally to involve large areas of the small intestine but may also advance distalward and produce a lesion which may be indistinguishable from ulcerative colitis.

From a review of our experience we have concluded (1) that no patient should be given definite assurance that he will be cured by surgery; (2) in about half the patients requiring surgery a defunctioning ileocolostomy or resection will provide sufficient relief without the need for a subsequent operation. In the other half, reoperation may sooner or later be required, but if a second operation is required, the likelihood of benefit from it is less than from the first, whatever type of operation is performed. The choice of procedure is by no means established. A working rule for the present might be (1) a defunctioning ileocolostomy for the uncomplicated and (2) primary or two stage resection for the complicated case.

We are dealing with an inflammation in which no specific bacterial flora can be incriminated, and yet the disease has all the earmarks of an infection. Finally, frequent failures by both surgical and medical treatment emphasize the need for a more intensive study of the pathogenesis of this disease.

ARNOLD STARR.

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THE BOOK SHELF

"AND SO TO BED"

ESTHER H. VINCENT, Evanston, Illinois

IN the days when Oliver Cromwell was lording it over England in true Puritanical style, there came down to London from his native Huntingdonshire, a young tailor by the name of John Pepys. As far back as the reign of Edward I, there had been Pepyses in the fen-country. Theirs was an orderly and administrative clan, slowly rising from the yeoman farmer class to that of gentry, and, since 1563, even sporting a coat of arms. In the early years, when monasteries and other church communities had blossomed like roses among the green hedges of that rich, level country, the Pepys men had flourished as business agents for the church dignitaries.

John, the tailor, was a younger son, and so quite naturally went into trade. In London he married fifteen year old Margaret Kight, the pretty but slatternly sister of a Whitechapel butcher, and "washmaid to my Lady Veere." This was regarded as a mésalliance even by the children, who were wont to refer to their maternal ancestry with a certain disparagement. However, the young couple settled down to family life in a house in Salisbury Court, Fleet St., hard by St. Bride's and almost opposite the present offices of *Punch*.

Samuel Pepys
1633-1703
After the portrait by John Hayls

In spite of a marked lack of cordiality on the part of the exclusive Merchant-Tailors' Guild, provincial Mr. Pepys prospered, and did so well that he was able to educate his children properly. Young Sam, born in 1633, was the fifth child and the second son of a large family, all of whom he survived. Educated in Huntingdon and at St. Paul's, London, he went up to Cambridge at barely eighteen. He entered Trinity Hall in 1650, but migrated shortly via a scholarship to Magdalene College, where he took his degree in 1653. Little is known of his undergraduate career, but it is recorded that he wrote a romance, *Love is a Cheat*, which he later destroyed, and that, along with another lad, he received a public scolding for having been "scandalously overseene in drink." It is certain, however, that he made good use of his study hours, for, in later life, he found himself possessed of a fuller store of learning than that of most of his associates.

Samuel's great-aunt Paulina had married Sir Sydney Montague, a noble "roundhead," and became the mother of Sir Edward Montague, friend of Cromwell and colonel in his army. Later, Sir Edward served as Vice-Admiral of the Fleet under Blake, became a full Admiral, and, in spite of his puritanical past, was created first Earl of Sandwich by Charles II. Until his death in action at sea, Sir Edward was Samuel Pepys's great friend and patron. It was through the efforts of this titled relative that Pepys secured public employment. When he first took office he

From the Archibald Church Library, Northwestern University Medical School.

was so ignorant of business that he did not even know the multiplication table, but he soon mastered all mechanical details by working overtime. The year 1660 saw him appointed Clerk of Acts in the Navy Office, and 1673 witnessed his elevation to Secretary of Naval Affairs. True to the tradition of his ancestors, he was an excellent public servant, shrewd, diligent and laborious. The only check to the flowing tide of his public life was during the fanatical excitement of the Popish Plot, when he was sent to the Tower on a trumped up charge of treason.

His scholarship and general culture were such that he achieved fellowship in the Royal Society, and was its president for two years. At various times he was Governor of Christ's Hospital, Master of Trinity House, and Master of the Clothworkers' Company. He represented Harwich in Parliament. His chief literary effort, other than the famous *Diary*, was the *Memoirs of the Royal Navy*, published in 1690. An inveterate collector, he surrounded himself with books, manuscripts, prints, ballads, and illustrious friends.

This great and good servant of the King kept a shorthand diary for almost ten years of his gayly respectable life, an intimate, gossipy, personal chronicle that has delighted a gasping world. Not only does it reveal the life of a bright, young man-about-town, an important public official during the Restoration, but it discloses with psychoanalytic frankness the secret activities of personality that most men hesitate to acknowledge even to themselves. There is nothing like it in any other language! His weakness for drink, fine clothes, playhouses and ladies, his marital relations, his back-stairs gossiping and wire-pulling, his good resolutions and his back-slidings, all are set down with candid-camera clarity. To read the *Diary* gives one a series of little, pleasurable shocks, as well as an amusing picture of the racy London of his day.

Robert Louis Stevenson regards Pepys as an eternal child, who preserved to middle life the gusty emotional immaturity of adolescence. Sweetly sentimental about himself, he sought with boyish anticipation all the joyous, worldly show. He must always be doing something agreeable and always be doing it with someone. He "knew not how to eat alone." A sterling humanist, he came very near to being an artist. Gleefully following the footsteps of the contemporary Mrs. Grundy, his morals were decent enough for his times. Respectability meant much to him, and he was wont to repent only when found out. He could not be bribed, but was "not so squeamish as to receive a present after." All is set down with happy earnestness and with completely unconscious humor.

In December 1655, at St. Margaret's, Westminster, Samuel married fourteen year old Elizabeth Marchant, daughter of a Huguenot refugee and an Irish woman. Elizabeth was pretty and "very good company when she is well." She had a bright, clever, little face, with a long upper lip, a full bosom, and a stylish forehead-curl. She chattered away in both English and French, and set out to learn arithmetic, music and "globes" from Sam. She was a good wife with a spirit of her own, although she had much to put up with. Sam was infernally jealous, yet saw no reason for loyalty on his own part. The Deb Willet episode of November, 1668 turned Elizabeth into an outraged Juno, and the *Diary's* wrong dating and expressions of "phrenzy" show Sam's mental reactions.

Elizabeth's memorial bust, erected by her husband in St. Olave's, Hart St., shows that she probably had adenoids, and it is known that she suffered from dysmenorrhea for many years. We know also that she had toothache and earache, the latter probably due to wax, since syringing cured it. In 1663 she had a perineal abscess which ended in a fistula.

On November 16, 1663, "Mr. Hollyard came, and he and I about our great work to look upon my wife's malady, which he did, and it seems her great conflux of humours heretofore that did use to swell there did in breaking leave a hollow which has since gone in further and further till it is now three inches deep, but as God will have it did not run into the bodyward, but keeping to the outside of the skin, and so he will be forced to cut open all along, and which my heart will not serve me to see done, and yet she will not have no one else to see it done, no, not even her mayde, and so I must do it poor wretch for her."

Next morn Mr. Hollyard on second thoughts "believes a fomentation will do as well, and what her mayde will be able to do as well without knowing what it is for, but only that it is for the piles." Mr. Hollyard received three pounds "for his work upon my wife, but whether it is cured or not I cannot say, but he says it will never come to anything, but it may ooze now and again."

An ischiorectal abscess is the probable diagnosis, although, considering her husband's vagrant habits, she may have acquired an acute inflammation of Bartholin's glands.

Later, she had abscesses in the cheek which "by God's mercy burst into the mouth, thus not spoiling her face." This plus the frequent toothache may have been due to pyorrhea. Elizabeth never became pregnant, although she had a couple of false alarms.

After fifteen somewhat hectic married years, she died in 1669, when only 29. The two Pepyses had just returned from a visit to France and the Low Countries, when Elizabeth fell desperately ill of a fever. Speculation as to the cause of death runs to typhoid or a septic pneumonia arising from pyorrhea.

The *Diary* abounds in medical topics—scrofula, smallpox, and plague, in addition to the author's own afflictions of indigestion, colds, eye strain, and urinary calculi. His life-long anxiety regarding "the stone" began with a country hike when the 20 year old Pepys and his Cambridge friends went out to visit a famous well. The hot and thirsty Samuel drank copiously of the cold water, and upon returning to his room, suffered an attack of renal colic. After several painful days, the stone dropped into the bladder. Contrary to the usual sequence, this stone was not voided, and may have formed the nucleus of the calculus which brought him to the operating table 5 years later. His mother once voided a large stone, which she threw into the fire, and later a brother developed symptoms of the same nature.

The outstanding event of Pepys's life was his operation for removal of the stone. This occurred on March 2, 1658, and ever afterward Pepys observed the day with pomp and circumstance. Most people of the seventeenth century endured surgery with little aid other than stout hearts and sluggish nervous systems, and so it was with Pepys, "poor wretch."

Cutting for the stone originated in India and reached Greece early enough to be mentioned in the Hippocratic Oath. The operation was first performed only on children. The child was held on the lap of one muscular assistant, while two others held its arms and legs. The surgeon put one or two fingers in the little anus and tried to push the stone down on to the perineum, while another assistant made use of hypogastric pressure. The surgeon then made a transverse incision above the anus, praying to the gods that he would hit the neck of the bladder. He then attempted to push out the stone with his fingers still in the anus. If this did not work, he grabbed the stone with forceps and pulled it through the perineum.

Later improvements included employment of still another assistant to sit on the patient's chest, and further resort was made to tying the patient with ropes. Pepys was probably kept quiet with yards of hemp. One can imagine the solemn arrival of the surgeon at the house with his dread army of assistants and tools. Two operations were current, that with "little apparatus," and that with "grand apparatus."

Preparations consisted of placing the patient on the table with head raised and buttocks projecting beyond the end. The legs were flexed at the knees and tied with ropes in a sort of clove-hitch. Two or three assistants held the victim, and he may have been given a sedative (mandrake or a "sleeping sponge" saturated with a solution of opium, hemlock or other soporific).

Operative procedure for the "little apparatus" consisted of inserting a finger into the anus, steadying the stone or pulling it down to a bulging perineum, cutting directly upon it, and pressing from above or extracting with forceps. The "grand apparatus," probably the technique used on Pepys, was a modified Jacques's operation with grooved staff and scalpel, a lateral incision and division of the prostate.

Since diagnosis was still primitive, and differential diagnosis doubtful, the wise surgeon provided himself with a "spare," an extra stone to foist upon the patient in case his efforts were unproductive. No small stone was ever cut out, for the patient naturally waited until his fear of the "stone" exceeded his fear of the "cutting."

As a result of this operation, some men went around with unhealed wounds, and some died of hemorrhage. Others lost control of the sphincter vesicae, were left with urinary fistulas, or lost their procreative power through interference with the seminal vesicles and ducts. The mortality was 15 to 20 per cent.

It is no wonder, then, that Pepys kept holy the anniversary of his operation, nor that he edged the story of it into every possible conversation. Nor that his interest in urinary pathology was so aroused that he voluntarily attended a lecture at Chirurgeon's Hall and visited the dissection room where a certain Dr. Scarborough discoursed to him on "the manner of the disease of the stone and the cutting and all other questions that I could think of."

Pepys's stone weighed about 2 ounces and was as large as a tennis ball. It was probably a uric acid calculus or had a uric acid nucleus with ammonium urate covering. Pepys kept it for years, and even had a pretty case made for it. Immediate result of the ordeal was satisfactory, but Pepys continued to suffer from renal colic all his life. He tried to ward off attacks by keeping a hare's foot in his pocket. A friend told him that the foot's lack of a joint made it inefficient. However,

"It is a strange thing how fancy works for I no sooner almost handled his foot but my belly began to be loose and to break wind and whereas I was in some pain yesterday and t' other day and in fear of more today I became very well and so continue."

When he died, an old man, his left kidney was found to be disorganized and contained "seven calculi all fast linked together and weighing four ounces."

By injuring both his vasa deferentia, the operation left him sterile but not impotent. The *Diary* shows him to have been in a more or less constant state of sexual excitement. His unusual incontinence may have been due to the continual irritation of the old scar on the perineum. Freudian complexes to the contrary, some insignificant irritation may make all the difference between virtue and concupiscence.

When he crossed his legs carelessly, a mild epididymitis ensued, much to his annoyance. And a sudden change from warm to cold weather would bring on severe pain, a probable reflex irritation from his kidney stones. In later life he seems to have been stricken with Bell's palsy and with something else that resembled pseudo-ileus, possibly another sort of reflex from his latent calculi. Everybody on the street witnessed his anguish and all the ladies sent in directions for enemas. The prescription that relieved him consisted of small beer.

Pepys's surgeon was Thomas Hollier, lithotomist at St. Thomas's Hospital, and one time Warden of the Barber Surgeons's Company and later Master, that same "Hollyard" who was called in to see Mrs. Pepys. Hollier had a reputation as a successful "stone cutter," having cut thirty persons in one year without a death. It was fortunate for Pepys that Hollier's instruments had not yet become septic. Attending with Hollier were Dr. James Moleyne, lithotomist at St. Bartholomew's Hospital, and also Dr. George Joyliffe, who shares claim to the discovery of the lymphatics. The Sloane collection of manuscripts contains two subscriptions written for Pepys at the time of his operation. One of them reads:

> "For Mr. Peapes who was cut for the stone, ye 28 March, 1658 and had a very great stone taken that day from him."
> (Signed) Dr. J. M., Dr. G. Jolly.

Its main constituent was lemon juice, to which a little syrup of radishes was added. Evidently Mr. Pepys was expected to have a little fever, but was not thought to be seriously ill, for the prescription states that the "mist. alba' was to be "sine moscho." At that time musk was considered to be the best remedy for grave illness, and few people died without a musk viaticum.

Dr. James Moleynes was "Surgeon of the Stone" at both St. Bartholomew's and St. Thomas's, and the College of Physicians granted him the unusual privilege of administering drugs in surgical diseases. He signed the first prescription alone and with his initials, like a physician. Surgeons signed their full names.

In May, 1660, Pepys had gone over to Holland with the ships which were to bring Charles II back to England. There was the usual royal salute with much firing of cannon. "Holding my head too much over the gun, I had almost spoiled my right eye." Two years later, at Portsmouth, Pepys "was much troubled in my eyes, by reason of the healths I have this day been forced to drink," and on returning to London, he was "let blood, about six ounces" by Dr. Hollier, who received five shillings for his pains.

By 1664 Pepys was having eye pain after long reading or writing, and made use of a "globe of glasse and a frame of oyled paper" to lessen glare. His experience was that of many another man in his thirties, when the strain of focussing, dependent upon some refractive error, has begun to send out SOS calls.

No mention of eye distress occurs in 1665, the year of the Great Plague and also a year of great naval activity. In May, 1666, his right eye was "sore and full of humour," a unilateral conjunctivitis, blamed upon "my late change of brewer." On December 24th he bought a pair of green spectacles. During 1667 only four entries suggest eye discomfort, but on November 4th he sought Turlington, the spectacle maker. In 1668 he consulted Turberville.

Turberville (D'Aubegney D'Urberville) had lately come up to London from Salisbury where he practiced as an oculist. The court physicians looked upon him as a country quack, and yet he was able to cure Queen Anne of sore eyes when she was a child. Oculists of that day founded their art on superstition and folk-lore, and knew little more than the corner drug-store clerk of today. They could make some simple but bunglesome refractions, and what cures they made were induced by chance. Their mercurial eye-washes may have helped heal venereal affections of the eye. And they had some knowledge of spectacles, such as they were, for both convex and concave lenses had long been discovered. But astigmatism was not recognized until 1827, and of simple accommodation men like Turberville knew nothing. Yet Turberville's tomb in Salisbury Cathedral bears this inscription,

> "Near this place lies interred the most expert and successful oculist that ever was and perhaps ever will be."

It is not apparent that Turberville did much for Pepys. No pre-nineteenth century oculist could have done much. Sir D'Arcy Power considers

Pepy's defect as hypermetropia with slight astigmatism. R. R. James thinks that much of the trouble was caused by muscle imbalance, possibly insufficiency of convergence. The spectacle maker would hardly have dissuaded him from the "old spectacles," the higher plus spheres, if a large hypermetropic error had been present, and Pepys himself admits that for a short reading period he could see as well as ever. That uniocular vision in a tube relieved him is in favor of his defect being concerned with binocular vision.

Poor Pepys's inability to get proper spectacles brought him to the sad conclusion that he was going blind. His entry for May 31, 1669 reads,

> "And thus ends all doubt I shall ever be able to do with my own eyes in the keeping of my journall I being not able to do it any longer having done it now so long as to undo my eyes almost every time that I take a pen in my hand. And therefore whatever comes of it must forbear."

Of course, he did not lose his sight, and as late as 1702 he was writing letters with his own hand, though he preferred dictating them. The increasing sclerosis of the lenses prevented his readjusting their curves, and neutralizing the insufficiency and asymmetry of his corneal curvature. When he automatically gave up trying to do the impossible he got relief. He needed a pair of compound lenses—spheres for his long sight and cylinders for his coincident astigmatism.

Pepys's minor ailments included frequent indigestion and colds. Once he had tonsillitis from "sitting sweating in the playhouse with the wind blowing through the windows on my head." And once he had "a boil under my chin which troubled me cruelly."

The *Diary* records his interest in the King's Evil, in smallpox, and in the plague, the ravages of which he witnessed. As guest of "chyrurgeon Pierce" he once witnessed a dissection of the genitourinary system. He also saw an early mastectomy. He was an intelligent observer of the first successful blood transfusion in dogs.

Sharing the current belief in tobacco as a plague preventive, he tried out a "chaw" one day, and soon lost his sense of apprehension, probably via the emesis that followed his unaccustomed use of the weed.

On the accession of William and Mary, Pepys retired to his books and his music, to his correspondence with Sir Isaac Newton, Dryden, and other sons of fame. And so to the grave in 1703, at the ripe age of seventy-one!

The exact necropsy findings are unknown, but there was gross pathological evidence of arteriosclerosis. The calyces of the left kidney contained a nest of seven stones. Note is made of the scar on the perineum. There is a probability that he had prostatic hypertrophy resulting in urgency and frequency of urination rather than ordinary incontinence.

The importance of the postmortem lies in the fact that, for the first time, an autopsy had been done on a colorful, interesting character in English life, a circumstance that proved to be a valuable asset to the medical scientists of the period.

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REVIEWS OF NEW BOOKS

IN the second edition of *Physical Medicine in General Practice*.[1] the author has included the advances which were made in physical medicine during the last World War, and the results of the work done by the National Foundation for Infantile Paralysis, as well as some of the newer subjects such as the combination of penicillin and fever therapy in syphilis and early ambulation in medical and surgical conditions. In the first fifteen chapters the physics and the physiological response of the tissues to the various modalities employed in physical medicine are discussed. The use of the modalities is described in sufficient detail so that a general practitioner can write an adequate prescription to enable the physical therapist to carry out accurate treatment. The chapters which deal with hydrotherapy and short wave diathermy are particularly well presented.

In the chapter on "Medical Rehabilitation" the author touches on all aspects of physical medicine and rehabilitation in the various types of conditions. This includes educational and vocational rehabilitation.

The last nine chapters of the book present diseases of the various body systems and the physical medicine measures which would be used as an adjuvant in their treatment. E. J. CUMMINS, JR.

THE editors of *Principles of Occupational Therapy*,[2] Helen S. Willard and Clare S. Spackman, in collaboration with nineteen other authors, give a clear and complete description of the subject from the present day standpoint. The book is divided into two main sections. The first section deals with the basic concepts in occupational therapy, outlining its history, scope, and aims and including a chapter on organization of an occupational therapy department. The second section discusses the applied principles in various types of hospitals and also in dealing with various types of disease and injury. The various activities and the way in which they may be used in the treatment of specific illnesses or injuries are well presented. In addition many of the activities described may be useful in the care of the patient for recreation even though they cannot be classed as treatment. The chapter on occupational therapy for patients with physical injuries is particularly well done. The association between occupational therapy and physical therapy is also brought out in this chapter. The chapter on occupational therapy for patients with mental disease is especially good and it would appear that in this branch of medicine occupational therapy has its greatest usefulness. The educational aims of occupational therapy as presented are an excellent goal and would contribute considerably to the efficiency of occupational therapy in the treatment of patients. The final chapters of the book outline the organization and activities of occupational therapy in Army, Navy, and Veterans' hospitals.

Particularly individuals having to do with the care of industrial or institutional cases would find this book of value. E. J. CUMMINS, JR.

THE third edition of *Recent Advances in Sex and Reproductive Physiology* by J. M. Robson[3] represents a revision of the 1940 edition and has a moderate amount of newly added material. It is concerned with sex and reproductive physiology of the female only. Sixty-five illustrations are listed but a good share of these are diagrams, tables, and graphs.

According to the foreword, the book was written to answer the questions of perplexed physicians. The emphasis, however, is placed on the presentation of experimental animal data. For example, in the section on cyclic changes in the endometrium, the first half of the discussion is concerned with the mouse, rat, rabbit, and bitch. The second half is devoted to primates, but man comes off a poor second in that most of the attention is devoted to the monkey. Some of the scanty human data could better have been omitted. Specifically, a full page is devoted to the outmoded and erroneous descriptions by Shaw (1925) of the cyclic changes in the endometrium. Shroeder's description is included but the significant works of Robert Meyer and Emil Novak on this subject are ignored. In fact, the innocent reader is left with the impression that this particular subject is one that is obscure and subject to great controversy.

In general the author's citations are representative of data obtained from experimental animals, although the rabbit is obviously Dr. Robson's favorite experimental animal. He has, however, made a good effort to evaluate critically the animal data. For this reason the book will be of value to some laboratory workers. Its reference value is limited, however, by the incompleteness of its survey of the literature.

The reviewer doubts that the book would be of great value to the perplexed clinician.

R. R. GREENE.

[1] PHYSICAL MEDICINE IN GENERAL PRACTICE. By William Bierman, M.D. With a chapter on Medical Rehabilitation by Dr. Sidney Licht, M.D. 2nd ed. New York and London: Paul B. Hoeber, Inc., 1947.

[2] PRINCIPLES OF OCCUPATIONAL THERAPY. Edited by Helen S. Willard, B.A., O.T.R., and Clare S. Spackman, B.S., M.S. in Ed., O.T.R. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

[3] RECENT ADVANCES IN SEX AND REPRODUCTIVE PHYSIOLOGY. By J. M. Robson, M.D., D.Sc. (Leeds), F.R.S.E. 3rd ed. Philadelphia and Toronto: The Blakiston Co., 1947.

THE high caliber of the first four editions is maintained in the fifth edition of *A Texthook of Pathology; an Introduction to Medicine*[1] by Dr. William Boyd.

Again Dr. Boyd has saved time for the cursory reader by outlining in his preface the new material which has been added to the content. This material has been well selected. As in previous editions emphasis is laid upon photomicography which is adequate and illustrates the individual lesions satisfactorily. The photographs of gross specimens are well distributed. The chapter on diseases of the central nervous system and that of bones is especially well organized.

The reviewer sees one minor criticism, that being an outmoded bibliography.

It would be advantageous if Professor Boyd could, in his next edition, add chapters on diseases of the skin, the eye, and of the ear, nose, and throat. Additional space might be devoted to the effects of heat and cold, of physical trauma including blast injury, and to the morphologic changes of radiation. These would enhance the value of this standard text.

M. C. WHEELOCK.

AN exhaustive treatise on cystitis and diseases of the urinary bladder has been written by Luis Cifuentes Delatte.[2] The author bemoaned the paucity in the literature of material on this subject and therefore conceived this work to fill in the "skipped" spots. He draws liberally upon what others have done and written before him; from his own experience he supplies what was lacking to give a complete, well-rounded study of the inflamed bladder.

The book is divided into two parts. The first treats of general concepts regarding cystitis and cystopathies. The normal bladder mucosa is described and the departures from this normal mucosa are compared in the various bladder diseases. A chapter on etiology includes a study of the many bacteria which may cause cystitis, their virulence, and the peculiar bladder reaction to the particular infection. Cystoscopic exploration and methods of obtaining biopsy material as well as general principles of treatment are given. The new chemotherapeutic and antibiotic substances receive special emphasis. The various recognized classifications of cystitis are reviewed. These the author believes are inadequate. He proposes a classification which appears all-inclusive and divides cystitis into primary and secondary. The former discusses bacterial, parasitic, viral, chemical, physical, and toxic. The latter takes up subjects as neoplasms, stones, malformations, trauma, fistulas, and the like.

Cystopathies make up the third section of the classification. Among others such topics as cysts, leucoplasia, allergies, amylordosis, and malacoplasia are considered.

[1]A TEXTBOOK OF PATHOLOGY; AN INTRODUCTION TO MEDICINE. By William Boyd, M.D., Dipl. Psych., M.R.C.P., Edin. F.R.C.P., Lond., LL.D., Sask., M.D., Oslo, F.R.S.C. 5th ed. Philadelphia: Lea & Febiger, 1947.

[2]CISTITIS Y CISTOPATIAS. By Luis Cifuentes Delatte. Madrid: Editorial Paz Montalvo, 1947.

The second part of the book is devoted to specific forms of bladder diseases. Tuberculosis, gonorrhea, actinomycosis, bilharzia, and lymphogranuloma each have complete chapter discussions. Trigonitis is given emphasis proportionate to the importance of this disorder and alone makes the volume a valued possession.

The book has 176 illustrations, 82 of which are in color and depict the pathologic process in amazingly sharp detail. The volume is a credit not only to the Spanish medical literature but represents a positive advance in worldwide urologic conceptions.

STEPHEN A. ZIEMAN.

THE third edition of the monograph on *Hernia* by Watson[3] deserves a place as a standard reference on the subject. All types of hernia are described with their chief symptoms, mechanism, and recommended methods of treatment. Many illustrations are used to explain the text. The author is justifiably critical of many operative procedures and advised those methods which have been most widely accepted. He is quite opposed, for example, to fascial suture repairs to which he objects as more traumatic than a carefully performed repair by means of fine suture material with or without fascial patch or cutis grafts.

There are many changes from the second edition. The author now advises silk or cotton suture instead of absorbable suture material. A new section on the repair of Cooper's ligament has been added. Early ambulation has been substituted generally for prolonged bed rest. Chapters have been added on the truss treatment of hernia and industrial hernia.

It seems unfortunate that a reference work otherwise so acceptable should have devoted so much space (68 pages) to the injection treatment of hernia. So far as the reviewer is concerned injection treatment should have been mentioned only to be condemned. The author's statement that in hernias previously treated by injections the dissection is a little difficult seems a gross understatement.

THOMAS C. DOUGLASS.

A comprehensive report on the cytological changes in the epithelial structure of the female generative tract is presented in *The Epithelia of Woman's Reproductive Organs*[4] by Drs. George N. Papanicolaou, Herbert F. Traut, and Andrew A. Marchetti. This study represents a co-operative effort by a group of workers with biologic, physiologic, and gynecologic interests and contributes to an understanding of functional characteristics of the female generative tract. The material for this study was obtained from the Woman's Clinic of the New York Hospital and

[3]HERNIA; ANATOMY, ETIOLOGY, SYMPTOMS, DIAGNOSIS, DIFFERENTIAL DIAGNOSIS, PROGNOSIS AND TREATMENT. By Leigh F. Watson, M.D., F.I.C.S. 3rd ed. St. Louis: C. V. Mosby Co., 1948.

[4]THE EPITHELIA OF WOMAN'S REPRODUCTIVE ORGANS. By George N. Papanicolaou, M.D., Herbert F. Traut, M.D., and Andrew A. Marchetti, M.D. New York: The Commonwealth Fund, 1948.

the monograph is based on a ten year study conducted by the Departments of Anatomy, and Obstetrics and Gynecology of Cornell University.

The changes in the ovary are accurately described starting with the developing follicle and continuing through ovulation and corpus luteum development. The changes in the epithelia of the tubes, uterine mucosa, endocervical glands, portio vaginalis of the cervix and vagina are then correlated with the cyclic change which occurred in the ovary. The descriptive text frequently refers the reader to the section of the book containing the photomicrographs and the beautiful drawings of Hashime Muryama. These illustrations help to tell an important part of the story and for any student of the cytology of the female genital tract, these drawings will be a great help in recognizing and identifying the cytologic changes which occur. A large colored chart at the close of the book serves to correlate all of the cytologic changes which occur in the various sections of the tract during each phase of the menstrual cycle. These authors have made a significant contribution which is well presented.

FRANCIS M. INGERSOLL.

MANY new therapeutic agents in the treatment of diseases of the ear have been studied during the war period and are just now coming to the notice of the otologists. These have all been added to the second edition of Nelson's *Loose-Leaf Medicine of the Ear*[1] and undoubtedly will prove useful when applied to the civilian population. The chapter on otologic aspects of aviation should be helpful to otologists and aviation companies as well.

The book has not suffered from the delay caused by the war; in fact the delay has been useful in that it allowed time for the latest investigations to appear in print.

The book is printed on good stock and is profusely illustrated. It should prove a quick and ready reference for the latest work in medicine of the ear.

JOHN F. DELPH.

AN excellent condensation of the periodical literature for the year 1947 is presented in *The 1947 Year Book of Obstetrics and Gynecology*[2] edited by J. P. Greenhill. The abstracts have been prepared with commendable clarity and faithfully portray the gist of the original work. The several illustrations are well chosen and well reproduced.

Dr. Greenhill's comments, while presenting his personal views, with which there will naturally be occasional disagreement, are written in a pleasant, conversational style.

During the many years of their publication the year books have almost become institutions in American medicine. They serve their purpose admirably in that they supply readable, accurate summaries not only to the physician who is too busy to read all of the current journals but also to anyone who wants a comprehensive review of the work in any special field. This book is a worthy addition to its many predecessors.

JOHN W. HUFFMAN.

A NEW surgical outline which will appear in a series of volumes is being published under the title *British Surgical Practice*.[3] The two editors-in-chief, Sir Ernest Rock Carling and J. Paterson Ross, have selected specialists in many fields and have given them a free hand in discussing the details concerning a host of problems confronting the average surgeon. Cursory examination of the first volume, without careful study of the introduction, immediately suggests unfavorable criticisms which are not tenable after one has studied the introduction. The editors-in-chief state at the outset that the series of volumes is prepared for the many physicians who lack easy access to libraries or medical centers. The work is directed primarily to these surgeons and is not intended to expound the minute details of highly specialized techniques. The outline is established, nevertheless, to show the average surgeon what might be accomplished by a highly trained expert in a certain field, working under the best possible conditions. The editors hope that the series will serve as a guide to those to whom is entrusted the surgical care of any type of patient. They admit freely that the specialist will not find the work of great advantage in his own case, but they subtly suggest that there are indeed portions which might be profitable for the specialist to peruse. The editors hasten to caution medical students that the volumes are not intended especially for them, but they point to the all too rare quality of simplicity which has been achieved, primarily by inviting only masters in knowledge and in expository skill to write the outlines in each field.

One refreshing feature of this volume, which we hope will be evident also in the forthcoming volumes, is the exclusion of obsolete procedures even though they may have become famous because of the relative renown of some of the older masters. The editors-in-chief accept full responsibility for the subject material, but they caution the reader, "having chosen our man, we should allow him to express his preferences without undue interference."

The first volume takes the reader from "Abdominal Emergencies" to "Autonomic Nervous System." The general setup of the volume is unusual in that the alphabetical arrangement is the primary means of listing subjects. This affords immediate and convenient access to descriptions of clinical phenomena and syndromes which might be puzzling the surgeon. The matter is thoroughly outlined in a consistent fashion. There is a profusion of excellent illustrations, and a decided advantage is the marginal title

[1] RENEWAL PAGES IN THE LOOSE-LEAF MEDICINE OF THE EAR. Edited by Edmund Prince Fowler, Jr., M.D., Med. Sc.D. New York and Edinburgh: Thomas Nelson & Sons, 1947.

[2] 1947 YEAR BOOK OF OBSTETRICS AND GYNECOLOGY. Edited by J. P. Greenhill, M.D. Chicago: Year Book Publishers, Inc., 1947.

[3] BRITISH SURGICAL PRACTICE. Under the general editorship of Sir Ernest Rock Carling, F.R.C.S., F.R.C.P., and J. Paterson Ross, M.S., F.R.C.S. Vol. 1. London: Butterworth & Co., Ltd.; St. Louis: The C. V. Mosby Co., 1947.

or label index which renders the work simplicity itself.

The chapter on abdominal emergencies is well done and treats of all of the important features without going into tiresome detail about any. The list of references is somewhat short but, by referring to the articles mentioned, the reader will find further bibliography which will lead the way to rather complete discussion.

The chapter on abdominal incisions presents most of the conventional information, with a few additions which are perhaps innovations to the American surgeon.

The chapter on abscesses appears notably lacking in a thorough discussion of modern chemotherapeutic adjuncts and antibiotics. Closer examination of this part of the chapter suggests that that is exactly the intention of the author; his major premise is that the treatment of abscesses is always surgical drainage, and it is implied that the surgeon will do well to keep that thought uppermost rather than to lean on therapeutic aids at an improper time. This is just one example of a delightful British manner of writing which displays itself throughout the volume. The habit of understatement has a tendency to emphasize facts which the careful surgeon will have in mind, and the style throughout is pleasant and makes for easy reading.

The chapter on actinomycosis is especially good and is accompanied by some excellent illustrations. The portion on treatment is most up-to-date and seems to be well in accord with the experience in various centers throughout the United States.

Considerable attention is given to adhesions and the author advocates a rather middle course in their treatment. The outline is followed in strictest detail here and protects the author from giving too much space to his own personal conclusions in regard to the importance of adhesions.

The adrenal glands come in for discussion, affording a rather quick and easy outline for the surgeon who, throughout his entire career, probably will not encounter more than one or two cases in which he must operate on these organs. The illustrations here are excellent and the implications and declarations concerning interplay of the endocrine systems afford a good review, even for those persons who are unusually well versed in this type of disease.

Several chapters are devoted to after-care, which brings in a consideration of physical therapy. This will be of interest to surgeons, although some of the views expressed may be controversial. Apparently the British method of postoperative follow-up care is a little different from the American method, in that the care is entrusted to physicians specializing in other fields. Of interest to the practitioner is the separate chapter on care after return to the home.

One disappointment in the chapter on postoperative complications has to do with vomiting, hiccups, and abdominal distention. Most American surgeons are strong advocates of the Wangensteen method of suction drainage. Its value has been proved in clinics too numerous to mention. Very little is said about this adjunct in this chapter; in addition, the comment is made that the only drugs that are effective in abdominal distention are the derivatives of opium. A very serious question may be raised here, in light of recent work which tends to suggest that the derivatives of opium might well be contraindicated. The giving of purges or enemas in this condition is also controversial but, as the general editors stated in their introduction, it would be difficult to get people to agree on all points.

In the section dealing with thrombosis and embolism it is interesting to note that the particular author is an advocate for the "walking treatment" of thrombophlebitis, which may be a controversial point, considering current opinion in many American clinics. The comments on prophylaxis of thrombosis and embolism are rather disappointing in that herapin is the only preparation that is even mentioned. It may be that this part of the article was prepared some time before the volume went to press, but it appears that the average American surgeon would have devoted considerably more space not only to heparin but to dicumarol and to ligation of femoral veins. The evidence now at hand in this country cannot be denied in regard to the efficacy of several of these measures.

In other portions of the volume, interesting sidelights on surgical practice are touched on briefly. These include such items as allergy and amebiasis, as well as amyloidosis.

The chapter on amputations is as complete as is necessary and contains valuable information in regard to prosthesis and rehabilitation.

One of the strongest aspects of the entire volume is the section on anesthesia. This is well outlined and condensed, and brings in the important points stressed by Lundy, McGill, and other authorities. Regional and spinal anesthetic procedures are covered as fully as space would permit.

The chapter on artificial anus is brief enough to avoid argument, but of necessity presents several pieces of apparatus which might raise some question in the minds of certain authorities. The experience in this country has been that there is no agreement about appliances and patent apparatus, and perhaps the less said the better.

A delightful surprise is the thorough discussion offered on appendicitis. After all, the average surgeon who will be away from the large medical centers will be confronted by this problem perhaps more than by any other. The illustrations and suggestions, and the general outline, bring out nothing particularly new but afford a clear résumé.

The author of the section on arteries has drawn heavily on anatomic studies and offers excellent illustrations in regard to the approach to various large vessels. The chances are that the occasional surgeon who has this volume handy can refer to it even in an emergency, which this chapter suggests. There is included a discussion on aneurysm and fistula, which of necessity is sketchy in places but at least offers a

picture of what the specialist can accomplish in ideal circumstances.

There is a rather long section on bone and joint surgery, complete with suggestions for postoperative training, including use of artificial limbs. This will be of great practical importance to isolated practitioners entrusted with the care of patients who need such training.

The section on asepsis and antisepsis is rather short, but implies a great deal more than space permits in the discussion. Fortunately, the list of references for this part is rather complete and the serious student will be able to find fuller information with this list as a guide. E. S. JUDD, JR.

THE second volume in the series, *British Surgical Practice*,[1] starts with the topic "Backache" and ends with "Bursae." It is difficult to review the entire volume in a short essay because of the wide variety of topics.

The several important chapters on bacteriology contain the necessary details, with a rather full outline of the important features. A discussion on penicillin coincides quite well with the accepted American views of today. Combined treatment with heparin and chemical agents is suggested in a short paragraph, although it is not elaborated. This treatment has proved to be of considerable value in this country in certain infections. The sulfonamides are mentioned rather briefly, but apparently are not held in as high regard as they still are in some parts of this country. There is a discussion on the anaerobic spore-bearing bacilli which is very timely in that these organisms must always be borne in mind. Now that the lessons of the war are receding into the background, it is well to call to mind some of the less common complications which cannot be overlooked. The usual sources of anaerobic infection are discussed and measures to overcome the complications resulting from such infections are mentioned as fully as space will allow. The importance of spores is emphasized and the types of wounds in which they are likely to be encountered are listed. In this regard there is a good discussion of the proper construction of an operating room as far as antisepsis and asepsis are concerned. The demonstrations of the apparent value of scrubbing of the hands for varying periods are somewhat primitive, but nonetheless effective. The current authorities are all quoted, and although the section on surgical technique is most brief, there are enough good references for those who are seriously interested.

In a subsection entitled "Chemotherapy" there are several statements which should be subjected to challenge. An example is the impression one gets that the sulfonamides have little or no effect on gram-negative bacilli. It is still felt in American circles that the sulfonamides are definitely indicated occasionally. Infections of the urinary tract with Escherichia coli still respond dramatically to sulfonamides, and there is good experimental evidence to show that peritonitis of the fecal type can be successfully combatted with these preparations. In addition, the military doctors in the Pacific areas in World War II found that several of the dysentery-producing organisms were almost specifically susceptible to sulfadiazine. Fortunately, this part of the text has a very thorough bibliography and there are arguments in support of most of the statements.

There are comments, with adequate illustrations, in respect to "general management of the patient" which include discussion of the proper construction of beds, plaster jackets, and so forth. The inevitable problem of bedsores is discussed briefly. A group of miscellaneous biochemical tests are outlined, with a short discussion of their use, which will be of value to the physician who operates only occasionally and will probably also afford a rapid review for experts. There are a few sections dealing with complications, scarcely considered surgical, which the practitioner will encounter. Examples of these are "bites and stings." Further in the text, there are other non-surgical topics, such as the blood-forming organs, leucemias, blindness, and high and low blood pressure.

A very strong section of this volume is the detailed discussion on the urinary bladder as regards injuries and neurogenic disturbances. This leads very logically to a discussion of tumors and operative technique on the bladder, which is sufficiently thorough to serve as a guide to the physician who occasionally operates.

More up to date, perhaps, than some parts of the book, is the section on blood transfusion. There is a clear, concise outline on agglutinogens, transfusion reactions, the Rh factor and so forth.

There is a rather prolonged section on bones and their pathology, which includes a discussion of bone grafting. This is a bit out of the field of the general practitioner and is probably much too sketchy for the orthopedic expert. Many of the cases cited and illustrations offered are most interesting from the standpoint of pathologic curiosities, but scarcely of prime importance from the standpoint of the general practitioner. If, as the introduction to the first volume suggests, the book is to be used as a ready reference to the isolated practitioner, many of the topics under discussion in the chapters on bone will merely be academic aids in classifying the case when the practitioner refers the patient to the large medical center for his definitive care.

There is a detailed section on brain surgery. Fortunately, the greater part of this section is devoted to practical applications alone. Although the chapters are written by neurosurgical experts, the material covers problems that will confront the general surgeon and occasionally the practitioner. The greatest stress is laid upon emergency and temporizing procedures, with clear outlines and illustrations to emphasize the practical applications. Implied and expressed restrictions are obvious as to where the physician who occasionally operates should stop. Inevi-

[1] BRITISH SURGICAL PRACTICE. Under the general editorship of Sir Ernest Rock Carling, F.R.C.S., F.R.C.P., and J. Paterson Ross, M.S., F.R.C.S. Vol. 2. London: Butterworth & Co., Ltd.; St. Louis: The C. V. Mosby Co., 1948.

tably, there is a discussion of brain tumor which is not particularly prolonged and which probably should stress a bit more the need for placing these patients in a category wherein they are to be cared for by experts only. Operations for decompression and for short-circuiting receive brief comment. The emergency treatment of lesions of the head is well outlined and there is a good discussion of surgical principles involved in cases of this type.

The section on carcinoma of the breast is rather short, probably because most of the material is now well known even in remote places. The portion of this section dealing with pathology is rather too brief, and there is little or no discussion of grading of malignancy, which may be a reflection of the light in which that convenient method is held throughout the British Isles. One of the most important statements made in this chapter is the following: "Aspiration may be needed to confirm a diagnosis of a cyst, but the possibility that carcinoma may exist in the wall of a cyst must never be forgotten." In a discussion of radical mastectomy, the indications and contraindications for the operation are much the same as those listed by authorities in the United States with one notable exception; namely, that of ulceration of the skin. Many authorities in the United States feel that radical mastectomy can still be accomplished with good results in the presence of some ulceration in certain cases. The conclusions about preoperative and postoperative roentgen therapy seem quite sound; namely, that radical operation first, followed by roentgen treatment, will probably be best in a vast majority of cases. The author of this section touches upon simple mastectomy plus roentgen therapy. Some of the Continental surgeons now are swinging back to that treatment in a large percentage of their cases. The author still seems to feel that the radical procedure is preferable, but is cognizant of the recent revival of the other method. Apparently, some of the patients with far advanced disease are treated by means of simple mastectomy only as a palliative measure, roentgen therapy being employed for obvious metastatic nodal tumors. Following this discussion there is a résumé of mastitis and infections of the breast which, while brief, is quite clear and to the point.

There is a short section on surgery of the lung as encountered in the treatment of bronchiectasis. Once again, the question arises as to whether this type of surgical treatment is to be performed by the physician who occasionally operates or whether it might not be better to leave it to the thoracic surgeon, who has all the accouterments for preoperative preparation and postoperative treatment.

E. S. JUDD, JR.

THE two hundred and eighteen page monograph by Dr. Noel A. Gillespie entitled *Endotracheal Anaesthesia*[1] is a revised and enlarged second edition. It includes a section on anesthesia problems peculiar to thoracic operations and the technique of tactile oral intubation with 12 additional illustrations of apparatus. There is a foreword by I. W. McGill, Ralph Walters, and Arthur Guedel.

The work describes the historical aspects of the subject with meticulous care and discusses in detail the theoretical and practical aspects of endotracheal intubations. After a short dissertation on insufflation technique the remaining portion is devoted to endotracheal inhalation anesthesia. The elementary fundamental facts of anatomy, physiology, pharmacology, and pathology are stated but not elaborated upon.

This book is a practical guide to a clinical skill. It will serve as a foundation upon which "may be built improvements in principle and technique which will make endotracheal anesthesia an even more useful aid than has been found at the present in the desire to bring help to surgeons and comfort and safety to patients."

Wider availability of endotracheal anesthesia depends upon an increased supply of medical men conversant with the facts and skilled by long experience in the technique of intubating the trachea. It is the author's hope that "this monograph may thus enable more patients to reap the benefits accruing both to surgeons and anesthetists from tracheal intubation."

There is included an excellent bibliography and references that will enable any reader sufficiently interested to refer readily to the original sources.

MARY KARP.

A SMALL 250 page volume *Symposium on Medicolegal Problems*[2] is of great interest and practical importance. It is a report of the medicolegal symposium which in the fall of 1945 was conducted jointly by the Institute of Medicine of Chicago and the Chicago Bar Association. It presents some of the problems which call for a joint effort of the two professions. Each of the subjects is presented first from the medical and then from the legal point of view by qualified representatives of the two professions. The discussion from the floor makes for lively reading.

There is a discussion of the conduct of the expert witness in court and the abuses of medical testimony with a suggested remedy in the form of disciplinary proceedings against any doctor or lawyer responsible for any irregularities in the presentation of such testimony. Any questionable testimony will be investigated by a committee of the Medical or Bar Association. The subject of artificial insemination is aired completely in a second discussion with all the implications considered in the open discussion. The medicolegal problems involved in the practice of pathology constitute a third chapter and many points of interest are brought up. Aside from a thorough discussion of

[1] ENDOTRACHEAL ANAESTHESIA. By Noel A. Gillespie, D.M., B.Ch., M.A.(Oxon.), M.D.(Wis.), D.A.(R.C.S. Eng.). Madison, Wisconsin: The University of Wisconsin Press, 1948.

[2] SYMPOSIUM ON MEDICOLEGAL PROBLEMS UNDER THE CO-SPONSORSHIP OF THE INSTITUTE OF MEDICINE OF CHICAGO AND THE CHICAGO BAR ASSOCIATION. Edited by Samuel A. Levinson, M.D., Ph.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1948.

the rules and regulations pertaining to autopsies, other problems such as the following are considered. What is the doctor's responsibility for sponges left in an abdomen? If a pathological specimen is sent across a state line is there a violation of interstate commerce? Can a physician prescribe for a patient in a state other than where he is licensed? What liability might accrue from the demonstration of preserved organs?

The fourth chapter deals with the subject of sterilization and the laws governing both compulsory and voluntary types. The liabilities to the doctor are discussed and a consideration given to the value of releases. The fifth chapter is concerned with the possible relationship between trauma and tumors and this subject precipitated heated discussion. If a relationship exists (contrary to unanimous medical opinion, which seemingly left the assembled legal minds unconvinced) and if verbal lashings can be considered traumatic, surely many neoplasms had their inception among the gentlemen of both professions present at session number five. The last chapter has to do with scientific tests in evidence with special consideration to blood groupings in paternity cases and tests for alcoholic intoxication.

All told this is a delightful volume concerning many interesting subjects. It should be attractive to both doctors and lawyers. STUART ABEL.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

OSTEOSYNTHESIS WITH A LONG INTRAMEDULLARY METAL PIN (KÜNTSCHER'S METHOD). By Emile Jan Moeys. Utrecht: Kemink en Zoon N.V., 1948.

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CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

ARTHUR W. ALLEN, Boston *President*
DALLAS B. PHEMISTER, Chicago, *President-Elect*

PRELIMINARY PROGRAM FOR 1948 CLINICAL CONGRESS THE BILTMORE HOTEL, LOS ANGELES OCTOBER 18 TO 22, 1948

LOS ANGELES, host city for the thirty-fourth Clinical Congress of the American College of Surgeons during the five days, October 18 to 22, 1948, is making preparations for one of the largest scientific assemblies that has ever been held in that fast growing medical center. Only once before has the American College of Surgeons held its Clinical Congress on the West Coast —in 1935 in San Francisco. The only other time in which the Clinical Congress was held west of the Mississippi River was in 1932 in St. Louis. Usually the Clinical Congresses rotate among four large cities: New York, Philadelphia, Boston, and Chicago, which have large numbers of approved hospitals in which to hold operative clinics for the education of the visiting surgeons.

The late Dr. Verne C. Hunt's suggestion to hold the 1942 Clinical Congress in Los Angeles was accepted in 1941, but because of the war, that and succeeding Congresses were cancelled up to 1946. Continuing transportation and hotel difficulties made it more feasible to hold the 1946 and 1947 sessions in Cleveland and New York, respectively, but now at the earliest opportunity the Board of Regents has taken advantage of the invitation of the Los Angeles surgeons. An exceptionally interesting five day program of operative and nonoperative clinics and demonstrations in the local hospitals and of scientific sessions, official meetings, Hospital Standardization conferences, medical motion picture showings, telecasts of operations, and scientific and technical exhibits at the headquarters hotel, is in the final stages of preparation.

The clinicians at some twenty-five participating hospitals have arranged programs which will incorporate the latest advances in surgical technique and operative procedures. The Los Angeles County Hospital is scheduling a series of operations which will be televised to a large room on the lower level of the Biltmore Hotel. The preliminary schedule of the clinics, demonstrations, and other presentations to be given at the hospitals, which appears in succeeding pages, will be finally revised and amplified immediately preceding the Congress and published in a *Clinical Bulletin* which will be distributed each day at the headquarters hotel.

The scientific sessions at the Biltmore Hotel, the adjacent Biltmore Theater, and the Philharmonic Auditorium across the street, will, like the clinics in the hospitals, include subjects in general surgery, obstetrics and gynecology, fractures, orthopedic surgery, thoracic surgery, neurosurgery, genitourinary surgery, and ophthalmology and otorhinolaryngology. Preliminary programs for these sessions appear on succeeding pages.

GENERAL ASSEMBLY

The first event on the Clinical Congress program will be the General Assembly for surgeons and hospital representatives which will be held on Monday morning, October 18, at 10:00 o'clock. Dr. Arthur W. Allen, president of the College, will preside at this meeting which will be the first session of the twenty-seventh annual Hospital Standardization Conference. Dr. Allen will discuss "The Progress of Hospital Standardization" and Dr. Irvin Abell, chairman of the Board of Regents, will present a report on field activities of the American College of Surgeons for 1948. Rev. John J. Flanagan, S.J., St. Louis, executive director of the Catholic Hospital Association, will speak on the "Preservation of the Voluntary Hospital System"; Dr. Leonard A. Scheele, Washington, Surgeon General, United States Public Health Service, will present the subject "Co-operation

between Voluntary Hospitals and Governmental Health Agencies"; and James A. Hamilton, Minneapolis, Professor of Hospital Administration, University of Minnesota, will describe "The Hospital of Tomorrow."

The program will conclude with a premiere showing of the film "Introduction to Fractures" sponsored by the American College of Surgeons and the Committee on Fractures and Other Traumas, and made possible through a grant from the Johnson & Johnson Research Foundation. It will be introduced by Dr. Robert H. Kennedy of New York, clinical professor of surgery, New York University, Post-Graduate, and chairman, Committee on Fractures and Other Traumas, American College of Surgeons.

PRESIDENTIAL MEETING

The opening evening session of the Clinical Congress will be devoted to the Presidential Meeting, at which the officers-elect, consisting of Dr. Dallas B. Phemister of Chicago as president, Dr. Howard A. Patterson of New York as first vice president, and Dr. Carl H. McCaskey of Indianapolis as second vice president will be installed. Dr. Arthur W. Allen of Boston, outgoing president and vice-chairman of the Board of Regents, will preside and will deliver the Presidential Address. The third Martin Memorial Lecture will be delivered by Dr. Clarence Crafoord, professor of surgery, University of Stockholm. Dr. Crafoord's subject will be, "Some Aspects of the Development of Intrathoracic Surgery."

The Annual Convocation will be held on the final evening, Friday. The formal initiation ceremonies and the presentation of the Fellowship Address by Dr. Lee A. Du Bridge, president, California Institute of Technology, Pasadena, will constitute the program. Dr. Du Bridge's subject will be, "The Physicist Meets the Doctor."

ASSEMBLY OF INITIATES

The 1948 initiates will attend an assembly on Friday afternoon from 1:30 to 2:15 o'clock in the Temple, Baptist Church. Dr. Dallas B. Phemister, incoming president of the College, will preside. Dr. Irvin Abell, chairman of the Board of Regents, and Dr. Bowman C. Crowell and Dr. Malcolm T. MacEachern, associate directors, will briefly outline the program of the College.

OTHER OFFICIAL MEETINGS

The annual meeting of the Governors and Fellows of the College will be held on Thursday afternoon at 1:30 o'clock. Reports on activities of the American College of Surgeons will be presented by the officers and chairmen of the standing committees, followed by the election of officers.

Meetings of three important committees will be held on Wednesday as follows: State and Provincial Executive Committees, 9:00 to 10:00 a.m.; State and Provincial Credentials Committees and Committees on Applicants and Judiciary Committees, 10:00 to 11:00 a.m.; and National and Regional Fracture Committees, 3:30 to 5:00 p.m. The Committee on the Library will be held on Thursday from 3:00 to 4:00 p.m. A dinner for the Committee on Fractures and Other Traumas, and chairmen of the Regional Committees, will be held from 6:00 to 8:00 p.m. on Thursday.

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

The Forum on Fundamental Surgical Problems, one of the most popular features of Clinical Congresses during the past few years, will be held on Tuesday through Friday mornings, in two sections meeting concurrently. Brief reports of original clinical and experimental observations relating to the broad aspects of surgery and the surgical specialties will be presented, under the general direction of Dr. Owen H. Wangensteen, chairman of the committee, Forum on Fundamental Surgical Problems.

GENERAL SURGERY

In general surgery, the program at the headquarters hotel will embrace three evening symposia and seven afternoon panel discussions.

The subjects for the symposia on Tuesday, Wednesday, and Thursday evenings, respectively, will be: "Malignant Lesions of the Thyroid Gland"; "Endometriosis" (the Fracture Oration will also be presented by Dr. Henry C. Marble of Boston at this session); and "Surgery of the Heart and Great Vessels."

The following subjects have been chosen for the afternoon panel discussions in general surgery, the first one of which will be held from 1:30 to 3:00 and the second from 3:30 to 5:00 o'clock on the days specified: "Acute Renal Failure in Surgical Patients" and "Tumors of the Mouth, Jaw and Face" on Monday; "Low Lying Malignant Lesions of the Bowel" and "Evaluation of Liver Function in Relation to Surgery" on Tuesday; "Peripheral Arterial Disease" and "Ulcerative Colitis" on Wednesday.

On Thursday afternoon there will be only one panel discussion, from 3:30 to 5:00, on "Isotopes in Surgery."

Detailed programs are published on succeeding pages.

SURGICAL SPECIALTIES

Panel discussions on the surgical specialties will be held on Friday afternoon from 1:30 to 4:45 o'clock. The panels will be held concurrently in the following fields: urology, orthopedic surgery, neurological surgery, gynecology and obstetrics, thoracic surgery, and plastic surgery. Programs are shown on succeeding pages.

OPHTHALMOLOGY

An exceptionally interesting program is being planned for ophthalmologists, consisting of two evening sessions, three morning panel discussions from 9:00 to 10:30, and an evening session on Wednesday in which a combined program with the otorhinolaryngologists will be held.

Subjects for the Tuesday evening session will be "Tumors of the Eyelids and the Conjunctiva," "Partial Keratectomy," and "Diathermy Cauterization of the Ciliary Body for Glaucoma." At the Wednesday evening combined session the subject will be "Neoplasms of the Eyelids, Orbit, Nose and Accessory Sinuses; Treatment and Plastic Repair." Subjects for the Thursday evening session will be "The Use of Retrobulbar Alcohol Injection for Ocular Pain," "Retinal Detachment," and "Correlation of the Anatomic Factors Concerned in the Ophthalmoscopic Appearance of Retinal Hemorrhages."

The morning panel discussions will be on the following subjects: "Surgical Management of: (1) Acute Inflammatory Glaucoma, (2) Chronic Simple Glaucoma, (3) Congenital Glaucoma" on Tuesday; "Congenital Cataract" on Wednesday; and "Surgery of the Oblique Muscles" on Thursday.

OTORHINOLARYNGOLOGY

The program in otorhinolaryngology will consist of two evening meetings, an evening session on Wednesday in which a combined program with the ophthalmologists will be held, and three morning panel discussions from 10:45 to 12:15. The fact that the morning panel discussions are planned to follow those on ophthalmology will enable surgeons who combine these specialties in their practice to attend both sessions.

The subjects for the evening meetings will be as follows: On Tuesday: "Effects of Streptomycin on Eighth Nerve Function," "Anatomical Considerations in Eye Surgery," and "Chronic Laryngeal Stenosis"; on Thursday: "Present Day Status of Fenestration Surgery," "Tumors of the Nasopharynx," "The Modern Management of Oro-Antral Fistula," and "Surgical Treatment of Laryngeal Cancer." The subjects for the Wednesday evening joint session are listed under "Ophthalmology" and also on succeeding pages which carry the detailed programs.

The morning panel discussions will be on the following subjects: "Rehabilitation of the Hard of Hearing" on Tuesday; "The Preparation of the Surgical Patient and Postoperative Care" on Wednesday; and "Diseases of the Esophagus" on Thursday.

SYMPOSIA ON CANCER

On Tuesday afternoon from 2:00 to 5:00 a Symposium on "Cancer Is Curable" will be held at which surgeons will report on series of cancer survivals, without recurrence, of from five to twenty-five years, and the College will report the additions to its Archives of Cancer Cures.

On Wednesday afternoon from 2:00 until 5:00 o'clock a Symposium on Cancer, with Dr. Grantley W. Taylor of Boston, chairman of the Cancer Committee, American College of Surgeons, presiding, is scheduled. The subjects for discussion are: "Tumors of the Central Nervous System," "Cancer of the Stomach—A Survey of 1,004 Cases," "Lymphomas," "Early Diagnosis for Proper Treatment of Cancer of the Urinary Bladder," "Tumors of Parotid," and "Cancer of the Ovary." The list of subjects together with the speakers is published on page 374.

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

Dr. Robert H. Kennedy of New York, chairman, Committee on Fractures and Other Traumas, will preside at the Symposium on Fractures and Other Traumas which will be held on Tuesday from 2:00 to 5:00 p.m. An interesting program is being developed under Dr. Kennedy's direction. The program appears on page 374.

HOSPITAL STANDARDIZATION CONFERENCE

The first formal session of the Clinical Congress will be the opening meeting of the twenty-seventh Hospital Standardization Conference at 10:00 o'clock on Monday morning, October 18. The preliminary plans for this meeting are outlined on a preceding page under the heading, "General Assembly." The hospital conferences will continue on Monday afternoon, with sessions following on Tuesday, Wednesday, and Thursday mornings, afternoons, and evenings.

Hospital administrators, members of governing boards, medical staff members, heads of the various hospital departments and their personnel, nurses, dietitians, medical records librarians, and many other persons directly concerned about hospital progress, will be interested in the discussions of current hospital problems.

Among the subjects which will be discussed at

the conferences will be the following: "New Developments in Medical Science which Affect Hospital Administration," "Office Facilities for Doctors in Relation to the Hospital," "Hospital Public Relations," "Discussion of Current Hospital Advances," "Approaching a Solution to our Nursing Problems," "Financial Relations with Patients and Doctors," "Problems of Small Hospitals," and "Progress Toward the Medical Center Concept." Tuesday evening will be devoted to a round table conference on Hospital Standardization; Wednesday evening to a forum for hospital trustees; Thursday evening to a forum on fundamental administrative problems with administrative interns and graduates of the schools of hospital administration as the participants; and Wednesday afternoon to a joint session with the American Association of Medical Record Librarians.

Aiding with the program are the following members of the Hospital Standardization Conference committee: Ritz E. Heerman, superintendent, The California Hospital, chairman; Paul C. Elliott, superintendent, Hollywood Presbyterian Hospital and President, Southern California Hospital Council; Alden B. Mills, administrator, Huntington Memorial Hospital, Pasadena; Sister Alphonsine, R.N., superintendent, St. Vincent's Hospital, Los Angeles; and Arthur J. Will, superintendent of charities, County of Los Angeles.

COMMITTEE ON ARRANGEMENTS

The Committee on Arrangements for the Clinical Congress in Los Angeles has been well organized and is actively functioning. The membership follows:

General Committee

Donald G. Tollefson, M.D., F.A.C.S., *Chairman*
Hugh T. Jones, M.D., F.A.C.S., *Vice-Chairman*
Harold Lincoln Thompson, M.D., F.A.C.S., *Secretary-Treasurer*
Gilbert J. Thomas, M.D., F.A.C.S., *Regent of the College*
E. Vincent Askey, M.D., F.A.C.S.
Max W. Bay, M.D., F.A.C.S.
J. MacKenzie Brown, M.D., F.A.C.S.
Lawrence Chaffin, M.D., F.A.C.S.
A. Ray Irvine, M.D., F.A.C.S.
Maurice Kahn, M.D., F.A.C.S.
W. E. MacPherson, M.D.
B. O. Raulston, M.D.
Louis J. Regan, M.D.
Carl Rusche, M.D., F.A.C.S.
Stafford Warren, M.D.

Committee for the Southern California Chapter

Ray B. McCarty, M.D., F.A.C.S., Riverside
Meredith G. Beaver, M.D., F.A.C.S., Redlands
Clarence E. Rees, M.D., F.A.C.S, San Diego
Carl G. Johnson, M.D., F.A.C.S., Long Beach
James H. Saint, M.D., F.A.C.S., Santa Barbara

Hospital Committee

The members of the hospital committee are listed on succeeding pages with the list of hospitals participating in the clinical program.

MEDICAL MOTION PICTURES

An appreciated feature of the Clinical Congress will again be the showing of medical motion pictures each day. The latest available pictures on surgery and related subjects will be presented. Special showings will be arranged of medical motion pictures in the fields of ophthalmology and otorhinolaryngology. Both sound and silent films will be shown, all of which will have been approved by the Committee on Motion Pictures. Some of the newer medical motion pictures now under production will be shown.

TECHNICAL AND SCIENTIFIC EXHIBITIONS

The Technical and Scientific Exhibits will occupy the Ballroom foyer, the Renaissance Room, and the Galleria of the Biltmore Hotel, according to present plans. Leading manufacturers of surgical instruments, x-ray apparatus, sterilizers, operating room lights, ligatures, dressings, hospital apparatus and supplies of all kinds and pharmaceuticals, and publishers of medical books will be represented.

ENTERTAINMENT FOR LADIES AND GUESTS

The Committee on Arrangements is planning a most interesting program for the wives and other guests of Fellows who are attending the Clinical Congress. Among the events planned are motor tours in and around Los Angeles to include such attractions as the Huntington Library, Griffith Park Planetarium, Olvera Street, Chinatown, visits to Hollywood studios and homes of motion picture stars, and radio broadcasts. Tickets to the broadcasts will be available upon request only at the registration desk at the Biltmore Hotel.

There will be a separate charge for each of the entertainment events. Each Fellow who registers in advance will receive a card listing the entertainment activities which he must check, if he is interested, and return the card accompanied by personal check to cover the total amount to Mrs. Verne C. Hunt, Box 95, San Marino, California.

ADVANCE REGISTRATION

Surgeons who wish to attend the Congress should register in advance. Under a new plan, advance registration will greatly expedite the procedure of registering.

No registration fee will be charged Fellows whose dues are paid to December 31, 1947. For

endorsed Junior and Senior Candidates, the fee will be $5.00. Non-Fellows who after individual consideration are permitted to register, will pay a fee of $10.00.

No registration fee will be required of initiates of the class of 1948.

HOTEL RESERVATIONS

It is desirable to make hotel reservations as early as possible because of the shortage of hotel rooms that prevails in Los Angeles as well as in other cities. In making these, communications should be addressed to the Los Angeles Convention and Visitors' Bureau, care of the Los Angeles Chamber of Commerce, stating that you will be attending the Clinical Congress of the American College of Surgeons. All hotel reservations for the Clinical Congress are to clear through this Bureau. No correspondence should be sent directly to the hotels. A form for reservations was enclosed in the letter recently sent to Fellows. Choice of hotels may be designated. The hotels in Los Angeles require a deposit in advance.

There follows the list of member hotels, Convention and Visitors' Bureau, Los Angeles Chamber of Commerce:

LOS ANGELES HOTELS

Rates (as of May 15, 1948), Subject to change

	Double	Twin
Alexandria, 210 West 5th St.	$ 6.00 up	$ 7.00 up
Ambassador, 3400 Wilshire Blvd.....	$10.00–17.00	$10.00–17.00
Biltmore, 515 South Olive St.	$ 7.50–12.00	$ 7.50–12.00
Chancellor, 3191 West 7th St.	$ 4.50– 6.00	$ 4.50– 6.00
Chapman Park, 3401 Wilshire Blvd.....	$ 6.00– 7.00	$ 7.00– 8.00
Clark, 426 South Hill St....	$ 4.50– 5.00	$ 5.50– 6.00
Commodore, 1203 West 7th St.....	$ 3.00– 3.50	$ 4.00
Elmar, 235 South Hope St..	$ 3.00	$ 3.00
Figueroa, 939 South Figueroa St...	$ 3.00– 4.00	$ 5.00
Gates, 6th and Figueroa Sts.	$ 3.50– 6.00	$ 3.50– 6.00
Gaylord, 3355 Wilshire Blvd.	$ 7.50 up	$ 7.50 up
Hayward, 6th and Spring Sts .	$ 5.00	$ 5.50
Hollywood Drake, 6724 Hollywood Blvd....	$ 3.50 up	$ 4.50 up
Hollywood Hotel, Hollywood at Highland...	$ 5.00– 6.00	$ 5.00– 6.00
Hollywood Knickerbocker, 1014 Ivar St.....	$ 6.00 up	$ 6.00
Hollywood Plaza, 1637 No. Vine St.....	$ 4.00 up	$ 4.50 up
Hollywood Roosevelt, 7000 Hollywood Blvd....	$ 7.00 up	$ 8.00 up
Kipling, 4077 West Third St.....	$ 3.00	$ 3.50– 4.00
Lankershim, 230 West 7th St.....	$ 3.00– 4.50	$ 4.50– 7.00
Mayan, 3049 West 8th St...	$ 4.00– 5.50	$ 5.00– 5.50
Mayfair, 1256 West 7th St..	$ 5.00 up	$ 6.00– 7.00
Natick, 108 West 1st St....		
Rosslyn, 111 West 5th St...	$ 4.00– 8.00	$ 4.50– 9.00
San Carlos, 507 West 5th Street.....	$ 4.50	$ 6.00
Savoy, 6th St. and Grand Ave...	$ 3.50– 5.50	$ 4.50– 5.00
Town House, 639 Commonwealth Ave..	$14.00	$14.00

CLINICAL CONGRESS PROGRAM IN BRIEF

Monday, October 18

8:00–12:00 Clinics and Demonstrations—Local Hospitals
10:00–12:30 General Assembly—Ballroom
1:30–3:00 Panel Discussion—Philharmonic Auditorium
2:00–4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl (Lower Level)
2:00– 5:00 Clinics and Demonstrations—Local Hospitals
2:00– 5:00 Hospital Conference—Ballroom
2:00– 5:00 Surgical Film Exhibition (General)—Biltmore Theater
3:30– 5:00 Panel Discussion—Philharmonic Auditorium
8:15–10:30 Presidential Meeting—Philharmonic Auditorium

Tuesday, October 19

8:00–12:00 Clinics and Demonstrations—Local Hospitals
8:30–12:30 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
8:30–12:30 Forum on Fundamental Surgical Problems—Ballroom
9:00–10:30 Panel Discussion, Ophthalmology—Conference Room No. 1
9:30–12:30 Hospital Conference—Music Room
9:30–12:30 Surgical Film Exhibition (General)—Biltmore Theater
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl
10:45–12:15 Panel Discussion—Otorhinolaryngology—Conference Room No. 1
1:30– 3:00 Panel Discussion—Philharmonic Auditorium
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl
2:00– 4:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
2:00– 5:00 Hospital Standardization Conference—Music Room
2:00– 5:00 Symposium: Cancer Is Curable—Ballroom
2:00– 5:00 Symposium on Fractures and other Traumas—Biltmore Theater
3:30– 5:00 Panel Discussion—Philharmonic Auditorium

7:00– 8:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
8:00–10:30 Hospital Conference—Music Room
8:00–10:30 Scientific Session, General Surgery—Philharmonic Auditorium
8:00–10:30 Scientific Session, Ophthalmology—Conference Room No. 1
8:00–10:00 Scientific Session, Otorhinolaryngology—Conference Room No. 5

Wednesday, October 20

8:00– 9:00 Meeting of Cancer Committee—Conference Room No. 6
8:00–12:00 Clinics and Demonstrations—Local Hospitals
8:30–12:30 Forum on Fundamental Surgical Problems—Ballroom
8:30–12:30 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
9:00–10:30 Panel Discussion-Ophthalmology—Conference Room No. 1
9:00–10:00 State and Provincial Executive Committees—Engineers' Club
9:30–12:30 Hospital Conference—Music Room
9:30–12:30 Surgical Film Exhibition (General)—Biltmore Theater
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl (Lower Level)
10:00–11:00 State and Provincial Credentials Committees and Committees on Applicants and Judiciary Committees.
10:45–12:15 Panel Discussion, Otorhinolaryngology—Conference Room No. 1
12:00– 2:00 Luncheon—Meeting of Board of Governors.
1:30– 3:00 Panel Discussion—Philharmonic Auditorium
2:00– 4:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl (Lower Level)
2:00– 5:00 Symposium on Cancer—Ballroom
2:00– 5:00 Surgical Film Exhibition (General)—Biltmore Theater
2:00– 5:00 Hospital Conference—Music Room
3:30– 5:00 Panel Discussion—Philharmonic Auditorium
3:30– 5:00 Meeting of National and Regional Fracture Committees
7:00– 8:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
8:00–10:00 Combined Session, Ophthalmology and Otorhinolaryngology—Conference Room No. 1
8:00–10:30 Scientific Session, General Surgery—Philharmonic Auditorium
8:00–10:30 Hospital Conference—Music Room

Thursday, October 21

8:00–12:00 Clinics and Demonstrations—Local Hospitals
8:30–12:30 Forum on Fundamental Surgical Problems—Ballroom
8:30–12:30 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
9:00–10:30 Panel Discussion, Ophthalmology—Conference Room No. 1
9:30–12:30 Hospital Conference—Music Room
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl
10:45–12:15 Panel Discussion, Otorhinolaryngology—Conference Room No. 1
1:30– 1:45 Adjourned Meeting, Governors—Ballroom
1:45– 3:00 Annual Meeting, Fellows—Ballroom
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl
2:00– 5:00 Hospital Conference—Music Room
2:30– 5:00 Surgical Film Exhibition (General)—Biltmore Theater
3:00– 5:00 Symposium, Graduate Training in Surgery—Ballroom
3:30– 5:00 Panel Discussion—Philharmonic Auditorium
3:00– 4:00 Committee on The Library—Conference Room No. 6
6:00– 8:00 Dinner for Committee on Fractures and Other Traumas and Chairmen, Regional Committees—Engineers' Club
7:00– 8:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
8:00–10:00 Hospital Conference—Music Room
8:00–10:30 Scientific Session-General Surgery—Philharmonic Auditorium
8:00–10:30 Scientific Session-Ophthalmology—Conference Room No. 1
8:00–10:30 Scientific Session-Otorhinolaryngology—Conference Room No. 8

Friday, October 22

8:00–12:00 Clinics and Demonstrations—Local Hospitals
8:30–12:30 Forum on Fundamental Surgical Problems—Ballroom
8:30–12:30 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
9:30–10:30 Surgical Film Exhibition (E.E.N.T.)—Biltmore Theater
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl
10:30–12:30 Surgical Film Exhibition (General)—Biltmore Theater
1:30– 2:15 Assembly of Initiates—Temple, Baptist Church
1:30– 4:45 Panel Discussions for each of the following:
Gynecology and Obstetrics—Conference Room No. 1
Plastic Surgery—Ballroom
Neurological Surgery—Conference Room No. 5
Thoracic Surgery—Engineers' Club
Urology—Conference Room No. 9
Orthopedic Surgery—Biltmore Theater
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl
2:00– 5:00 Clinics and Demonstrations—Local Hospitals
7:30– 8:00 Assembly of Initiates for Processional—Temple, Baptist Church
8:15–10:00 Convocation—Philharmonic Auditorium

EVENING SCIENTIFIC SESSIONS

GENERAL SURGERY

Tuesday, 8:00–10:30 p.m.

Symposium on Malignant Lesions of the Thyroid Gland

Histologic Types of Thyroid Carcinoma and Their Clinical Significance. FRANK W. FOOTE, M.D., New York.
Aberrant Thyroid. BRIEN T. KING, M.D., Seattle.
Malignancy in Nodular Goiter. WARREN H. COLE, M.D., Chicago.
Radioactive Iodine for the Treatment of Thyroid Disease Including Carcinoma. MYRON PRINZMETAL, M.D., Los Angeles.

Wednesday, 8:00–10:30 p.m.

Fracture Oration. Colles' Fracture. HENRY C. MARBLE, M.D., Boston.

Symposium on Endometriosis

Etiology of Endometriosis. BROOKS RANNEY, M.D., Chicago.
Surgical Procedures Involved in the Treatment of Endometriosis. VIRGIL S. COUNSELLER, M.D., Rochester, Minnesota.
The Medical Treatment and Significance of Endometriosis. JOE V. MEIGS, M.D., Boston.

Thursday, 8:00–10:30 p.m.

Symposium on Surgery of the Heart and Great Vessels

Surgical Treatment of Pulmonic Stenosis. ALFRED BLALOCK, M.D., Baltimore.
The Surgical Treatment of Constrictive Pericarditis. EMILE F. HOLMAN, M.D., San Francisco.
The Surgery of Patent Ductus Arteriosus. JOHN C. JONES, M.D., Los Angeles.
Treatment of Coarctation of the Aorta. ROBERT E. GROSS, M.D., Boston.

OPHTHALMOLOGY

Tuesday, 8:00–10:30 p.m.

Tumors of the Eyelids and the Conjunctiva. MICHAEL J. HOGAN, M.D., San Francisco.
Partial Keratectomy. GEORGE L. KILGORE, M.D., San Francisco.
Diathermy Cauterization of the Ciliary Body for Glaucoma. SAMUEL J. MEYER, M.D., Chicago.

Thursday, 8:00–10:30 p.m.

The Use of Retrobulbar Alcohol Injection for Ocular Pain. ALFRED E. MAUMENEE, M.D., Baltimore.
Retinal Detachment. DOHRMANN K. PISCHEL, M.D., San Francisco.
Correlation of the Anatomic Factors Concerned in the Ophthalmoscopic Appearance of Retinal Hemorrhages. HOMER E. SMITH, M.D., Salt Lake City.

OTORHINOLARYNGOLOGY

Tuesday, 8:00–10:30 p.m.

Effects of Streptomycin on Eighth Nerve Function. PAGE NORTHINGTON, M.D., Oakland.
Anatomical Considerations in Ear Surgery. J. BROWN FARRIOR, M.D., Tampa.
Chronic Laryngeal Stenosis. JOHN B. ERICH, M.D., Rochester, Minnesota.

Thursday, 8:00–10:30 p.m.

Present Day Status of Fenestration Surgery. LEIGHTON F. JOHNSON, M.D., Boston.
Tumors of the Nasopharynx. HARRY C. ROSENBERGER, M.D., Cleveland.
The Modern Management of Oro-Antral Fistula. RICHARD THOMAS BARTON, M.D., Beverly Hills.
Surgical Treatment of Laryngeal Cancer. CHEVALIER L. JACKSON, M.D., Philadelphia.

COMBINED SESSION—OPHTHALMOLOGY—OTORHINOLARYNGOLOGY

PANEL DISCUSSION

Wednesday, 8:00–10:30 p.m.

Neoplasms of the Eyelids, Orbit, Nose and Accessory Sinuses; Treatment and Plastic Repair.
Moderator: GORDON B. NEW, M.D., Rochester, Minnesota.
Collaborators: AUBREY G. RAWLINS, M.D., San Francisco; EDMUND B. SPAETH, M.D., Philadelphia; JOHN B. ERICH, M.D., Rochester, Minnesota; MICHAEL J. HOGAN, M.D., San Francisco.

PANEL DISCUSSIONS

GENERAL SURGERY

Monday, 1:30–3:00 p.m.

Acute Renal Failure in Surgical Patients
Moderator: FREDERICK A. COLLER, M.D., Ann Arbor.
Collaborators: CHARLES D. CREEVY, M.D., Minneapolis; ERNEST E. MUIRHEAD, M.D., Dallas; WILLIAM O. RUSSELL, M.D., Santa Barbara.

Monday, 3:30–5:00 p.m.

Tumors of the Mouth, Jaw and Face
Moderator: GORDON B. NEW, M.D., Rochester, Minnesota.
Collaborators: LOUIS T. BYARS, M.D., St. Louis; J. ELLIOTT SCARBOROUGH, JR., M.D., Atlanta; ERNEST M. DALAND, M.D., Boston.

Tuesday, 1:30–3:00 p.m.

Low Lying Malignant Lesions of the Bowel
Moderator: FRED W. RANKIN, M.D., Lexington.
Collaborators: R. KENNEDY GILCHRIST, M.D., Chicago; THOMAS E. JONES, M.D., Cleveland; JESSIE GRAY, M.D., Toronto.

Tuesday, 3:30–5:00 p.m.

Evaluation of Liver Function in Relation to Surgery
Moderator: NATHAN A. WOMACK, M.D., Iowa City.
Collaborators: EVERETT I. EVANS, M.D., Richmond; ARTHUR H. BLAKEMORE, M.D., New York; JESSE L. BOLLMAN, M.D., Rochester, Minnesota.

Wednesday, 1:30–3:00 p.m.

Peripheral Arterial Disease
Moderator: ALTON OCHSNER, M.D., New Orleans.
Collaborators: NORMAN E. FREEMAN, M.D., San Francisco; I. RIDGEWAY TRIMBLE, M.D., Baltimore; ROBERT R. LINTON, M.D., Boston.

Wednesday, 3:30–5:00 p.m.

Ulcerative Colitis
Moderator: HENRY W. CAVE, M.D., New York.
Collaborators: ALBERT J. SULLIVAN, M.D., New Orleans; CLARENCE DENNIS, M.D., Minneapolis; CLAUDE F. DIXON, M.D., Rochester, Minnesota.

Thursday, 3:30–5:00 p.m.

Isotopes in Surgery
Moderator: GEORGE M. CURTIS, M.D., Columbus.
Collaborators: EARL R. MILLER, M.D., San Francisco; JOSEPH G. HAMILTON, M.D., Berkeley; OLIVER COPE, M.D., Boston; BEVERLY C. SMITH, M.D., New York.

SURGICAL SPECIALTIES, *Friday, 1:30–4:55 p.m.*

UROLOGY

Moderator: REED M. NESBIT, M.D., Ann Arbor.

Present Day Management of Urinary Tract Infections

Collaborators: GRAYSON CARROLL, M.D., St. Louis; WILLOUGHBY E. KITTREDGE, M.D., New Orleans; GILBERT J. THOMAS, M.D., Beverly Hills.

The Clinical Management of Branched Renal Calculi

Collaborators: JAMES T. PRIESTLEY, M.D., Rochester, Minnesota; RUBIN H. FLOCKS, M.D., Iowa City; THOMAS E. GIBSON, M.D., San Francisco.

ORTHOPEDIC SURGERY

Moderator: JOHN C. WILSON, M.D., Los Angeles.

Mechanical Derangements of the Knee Joint

Collaborators: DOUGLAS D. TOFFELMIER, M.D., Oakland; FRANCIS J. COX, M.D., San Francisco; FRANCIS E. WEST, M.D., San Diego.

Fractures About the Hip

Collaborators: J. SIMS NORMAN, M.D., Pueblo; JOHN J. LOUTZENHEISER, M.D., San Francisco; JAMES K. STACK, M.D., Chicago.

NEUROLOGICAL SURGERY

Moderator: HOWARD C. NAFFZIGER, M.D., San Francisco.

Cerebral Angiography

Collaborators: CARL F. LIST, M.D., Grand Rapids; EDWIN B. BOLDREY, M.D., San Francisco; EARL R. MILLER, M.D., San Francisco.

GYNECOLOGY AND OBSTETRICS

Moderator: JOHN C. BURCH, M.D., Nashville.

Hysterectomy. Physiological Considerations—Indications

Collaborators: LANGDON PARSONS, M.D., Boston; CONRAD G. COLLINS, M.D., New Orleans; R. GLENN CRAIG, M.D., San Francisco; KARL H. MARTZLOFF, M.D., Portland.

Hysterectomy. Technical Considerations—Complications

Collaborators: (Same as above)

THORACIC SURGERY

Moderator: FRANK S. DOLLEY, M.D., Los Angeles

Diagnosis and Surgical Treatment by Pulmonary Resection for Carcinoma, Bronchiectasis, and Tuberculosis

Collaborators: EVARTS A. GRAHAM, M.D., St. Louis; FRANK B. BERRY, M.D., New York; HERBERT C. MAIER, M.D., New York.

Surgery of the Esophagus

Collaborators: RALPH H. ADAMS, M.D., Louisville; LYMAN A. BREWER, III, M.D., Los Angeles; JOHN W. STRIEDER, M.D., Boston.

PLASTIC SURGERY

Moderator: TRUMAN G. BLOCKER, JR., M.D., Galveston.

Congenital Facial Deformities

Collaborators: DOUGLAS W. MACOMBER, M.D., Denver; WILLIAM S. KISKADDEN, M.D., Los Angeles; THOMAS D. CRONIN, M.D., Houston; WALLACE H. STEFFENSEN, M.D., Grand Rapids.

Burn Contractures of the Extremities

Collaborators: GEORGE V. WEBSTER, M.D., Pasadena; GERALD B. O'CONNOR, M.D., San Francisco; LOUIS T. BYARS, M.D., St. Louis; NATHANIEL B. SODERBERG, M.D., Phoenixville, Pennsylvania

OPHTHALMOLOGY

Tuesday, 9:00–10:30 a.m.

Surgical Management of Glaucoma

Moderator: A. RAY IRVINE, M.D., Los Angeles.

Collaborators: HAROLD L. GOSS, M.D., Seattle; ROBERT N. SHAFFER, M.D., San Francisco; J. HEWITT JUDD, M.D., Omaha.

Wednesday, 9:00–10:30 a.m.

Congenital Cataract
Moderator: OTTO BARKAN, M.D., San Francisco.
Collaborators: S. RODMAN IRVINE, M.D., Los Angeles; HAROLD F. WHALMAN, M.D., Los Angeles; RAYMOND J. NUTTING, M.D., Oakland.

Thursday, 9:00–10:30 a.m.

Surgery of the Oblique Muscles
Moderator: C. ALLEN DICKEY, M.D., San Francisco.
Collaborators: ORWYN H. ELLIS, M.D., Los Angeles; AVERY MORLEY HICKS, M.D., San Francisco; ALFRED R. ROBBINS, M.D., Los Angeles.

OTORHINOLARYNGOLOGY

Tuesday, 10:45 a.m.–12:15 p.m.

Rehabilitation of the Hard of Hearing
Moderator: WALTER P. WORK, M.D., San Francisco.
Collaborators: HOWARD P. HOUSE, M.D., Los Angeles; S. RICHARD SILVERMAN, M.D., St. Louis; HAROLD M. E. BOYD, M.D., Los Angeles.

Wednesday, 10:45 a.m.–12:15 p.m.

The Preparation of the Surgical Patient and Post-Operative Care
Moderator: COLBY HALL, M.D., Los Angeles.
Collaborators: VICTOR GOODHILL, M.D., Los Angeles; CHARLES F. MCCUSKEY, M.D., Los Angeles; HAROLD OWENS, M.D., Los Angeles.

Thursday, 10:45 a.m.–12:15 p.m.

Diseases of the Esophagus
Moderator: ALDEN H. MILLER, M.D., Los Angeles.
Collaborators: SIMON JESBERG, M.D., Los Angeles; LEWIS F. MORRISON, M.D., San Francisco; AMBROSE S. CHURCHILL, M.D., Los Angeles.

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

Tuesday, 2:00–5:00 p.m.

ROBERT H. KENNEDY, M.D., F.A.C.S., New York; Chairman, Committee on Fractures and Other Traumas, Presiding.
Avulsions of the Skin. CARLETON MATHEWSON, JR., M.D., F.A.C.S., San Francisco.
Secondary Closure of Wounds. HARRY C. BLAIR, M.D., F.A.C.S., Portland.
Care of Acute Amputations of the Fingers. WALTER C. GRAHAM, M.D., F.A.C.S., Santa Barbara.
Fractures of the Lower End of the Humerus in Children. JOHN C. WILSON, M.D., F.A.C.S., Los Angeles.
Acute Arterial Emergencies. JERE W. LORD, JR., M.D., F.A.C.S., New York.
Evaluation of Principles Concerned in Management of Trauma to the Kidney. LAZARUS A. ORKIN, M.D., F.A.C.S., New York.

SYMPOSIUM ON CANCER

Wednesday, 2:00–5:00 p.m.

GRANTLEY W. TAYLOR, M.D., F.A.C.S., Boston; chairman, Cancer Committee, American College of Surgeons, presiding.
Tumors of the Central Nervous System. EDWIN B. BOLDREY, M.D., F.A.C.S., San Francisco; assistant clinical professor of surgery, University of California Medical School.
Cancer of the Stomach: A Survey of 1004 Cases. STANLEY E. LAWTON, M.D., F.A.C.S., Chicago; assistant professor of surgery, University of Illinois (Rush) College of Medicine.
Lymphomas. SIDNEY FARBER, M.D., Boston; assistant professor of pathology, Harvard University Medical School.
Early Diagnosis for Proper Treatment of Cancer of Urinary Bladder. GILBERT J. THOMAS, M.D., F.A.C.S., Beverly Hills; associate clinical professor of surgery (urology), University of Southern California School of Medicine.

Tumors of Parotid. DANELY P. SLAUGHTER, M.D., F.A.C.S., Chicago; assistant professor of surgery, University of Illinois College of Medicine.
Cancer of the Ovary. JOE V. MEIGS, M.D., F.A.C.S., Boston; clinical professor of gynecology, Harvard University Medical School.

PRESIDENTIAL MEETING

Monday, 8:15–10:30 p.m.—The Philharmonic Auditorium

ARTHUR W. ALLEN, M.D., F.A.C.S., Boston; President, American College of Surgeons, Presiding.
Processional—Officers, Regents, and Distinguished Guests
Invocation
Address of Welcome
DONALD G. TOLLEFSON, M.D., F.A.C.S., Los Angeles:
Chairman, Committee on Arrangements
Introduction of Distinguished Guests
IRVIN ABELL, M.D., F.A.C.S., Louisville;
Chairman, Board of Regents
Address of the Retiring President: Looking Forward
ARTHUR W. ALLEN, M.D.
Inauguration of Officers:
Presented by THOMAS E. JONES, M.D., F.A.C.S., Cleveland;
Retiring First Vice President
President: DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago
First Vice President: HOWARD A. PATTERSON, M.D., F.A.C.S., New York
Second Vice President: CARL H. MCCASKEY, M.D., F.A.C.S., Indianapolis
The Third Martin Memorial Lecture: Some Aspects of the Development of Intrathoracic Surgery
CLARENCE CRAFOORD, M.D., Stockholm, Sweden; Professor of Surgery, Karolinska Mediko-Kirurgiska Institutet

CONVOCATION

Friday, 8:15–10:30 p.m.—The Philharmonic Auditorium

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Processional—Initiates, Officers, Regents, and Distinguished Guests
Invocation
Presentation of Initiates for Fellowship
IRVIN ABELL, M.D., F.A.C.S., Louisville;
Chairman, Board of Regents
Fellowship Pledge. Recital by Initiates
Conferring of Fellowships by the President
DALLAS B. PHEMISTER, M.D.
Conferring of Honorary Fellowships
The President
Fellowship Address: The Physicist Meets the Doctor
LEE A. DUBRIDGE, Ph.D., Pasadena, California
President, California Institute of Technology
Recessional
Reception by the Officers and Regents for the Initiates and Fellows

ANNUAL MEETING, BOARD OF GOVERNORS OF THE COLLEGE

Wednesday, 12:15–2:00 p.m.—Ballroom, The Biltmore Hotel

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Statement by the Chairman of the Board of Regents
IRVIN ABELL, M.D., F.A.C.S., Louisville

Brief Reports on the Activities, Problems, and Progress of the American College of Surgeons
ARTHUR W. ALLEN, M.D., F.A.C.S., Boston; Immediate Past President
FREDERICK A. COLLER, M.D., F.A.C.S., Ann Arbor; Regent
Discussion by Governors and Regents

ADJOURNED MEETING, BOARD OF GOVERNORS OF THE COLLEGE

Thursday, 1:30 p.m.—Ballroom, The Biltmore Hotel

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Report of Committee on Nominations to the Board of Governors

ANNUAL MEETING, FELLOWS OF THE COLLEGE

Thursday, 1:45–3:00 p.m.—Ballroom, The Biltmore Hotel

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Report of Committee on Nominations
Election of Officers and Governors of the College
Report of the Treasurer.
DALLAS B. PHEMISTER, M.D., Chicago; Treasurer
EDWARD G. SANDROK, Comptroller
Cancer Committee
GRANTLEY W. TAYLOR, M.D., F.A.C.S., Boston; Chairman
Committee on Fractures and Other Traumas
ROBERT H. KENNEDY, M.D., F.A.C.S., New York; Chairman
Committee on Graduate Training in Surgery
FREDERICK A. COLLER, M.D., F.A.C.S., Ann Arbor; Chairman
Hospital Department
Hospital Standardization
MALCOLM T. MACEACHERN, M.D., Associate Director
Graduate Training in Surgery
PAUL S. FERGUSON, M.D., Assistant Director, Hospital Activities
GEORGE H. MILLER, M.D., Director of Educational Activities
Sectional Meetings
MALCOLM T. MACEACHERN, M.D., Associate Director
H. PRATHER SAUNDERS, M.D., F.A.C.S., Associate Director
Credentials Department
a. Credentials Committee
b. Committees on Applicants
c. Committee on History Reviews
H. PRATHER SAUNDERS, M.D.
Clinical Research
Medical Service in Industry
BOWMAN C. CROWELL, M.D., Associate Director
CHARLES F. BRANCH, M.D., Assistant Director
G. R. HESS, M.D., Assistant
Medical Motion Pictures
Publications
ELEANOR K. GRIMM, Administrative Executive
Library and Department of Literary Research
L. MARGUERIETE PRIME, Director of Library and Department of Literary Research
Public Relations
LAURA G. JACKSON, Director of Public Relations
The American College of Surgeons: Fellowship Obligations and Opportunities
IRVIN ABELL, M.D., Louisville; Chairman, Board of Regents

PRELIMINARY CLINICAL PROGRAM

PARTICIPATING HOSPITALS AND HOSPITAL CLINICS COMMITTEE

The California Hospital, Los Angeles—William F. Quinn, M.D.
Cedars of Lebanon Hospital, Los Angeles—Adolph A. Kutzmann, M.D., F.A.C.S.
Children's Hospital, Los Angeles—J. Norton Nichols, M.D., F.A.C.S.
French Hospital, Los Angeles—Pierre Paul Viole, M.D.
Glendale Sanitarium and Hospital, Glendale—Eugene J. Joergenson, M.D., F.A.C.S.
Hollywood Presbyterian Hospital-Olmsted Memorial—William H. Snyder, M.D., F.A.C.S.
Hospital of the Good Samaritan, Los Angeles—Francis M. McKeever, M.D.
Collis P. and Howard Huntington Memorial Hospital, Pasadena—Leroy B. Sherry, M.D., F.A.C.S.
Los Angeles County Hospital, Los Angeles—Clarence J. Berne, M.D., F.A.C.S.
Methodist Hospital of Southern California, Los Angeles—Paul A. Quaintance, M.D., F.A.C.S.
Orthopaedic Hospital, Los Angeles—Ward M. Rolland, M.D., F.A.C.S.
Physicians and Surgeons Hospital, Glendale—John R. Paxton, M.D., F.A.C.S.
Queen of Angels Hospital, Los Angeles—Donald E. Ross, M.D., F.A.C.S.
St. Francis Hospital, Lynwood—Finis G. Cooper, M.D., F.A.C.S.
St. John's Hospital, Santa Monica—George Arnold Stevens, M.D., F.A.C.S.
St. Joseph Hospital, Burbank—Ralph H. Walker, M.D., F.A.C.S.
St. Luke Hospital, Pasadena—James M. Marshall, M.D., F.A.C.S.
St. Vincent's Hospital, Los Angeles—William P. Kroger, M.D., F.A.C.S.
Santa Fe Coast Lines Hospital, Los Angeles—Richard J. Flamson, M.D., F.A.C.S.
Santa Monica Hospital, Santa Monica—Leo J. Madsen, M.D., F.A.C.S.
U.S. Army, McCornack General Hospital, Pasadena—Colonel Lawrence C. Ball, M.C., U.S.A.
U.S. Naval Hospital, Long Beach—Captain F. C. Hill, M.D.
U.S. Veterans Administration, Birmingham General Hospital, Van Nuys—Joseph A. Weinberg, M.D., F.A.C.S.
U.S. Veterans Administration Center, Wadsworth General Hospital, Sawtelle—Francis R. X. Byron, M.D., F.A.C.S.
White Memorial Hospital, Los Angeles—Clarence E. Stafford, M.D., F.A.C.S.

CLINICS IN LOS ANGELES AND VICINITY HOSPITALS

THE CALIFORNIA HOSPITAL, LOS ANGELES

Tuesday

8:00–12:00. *General Surgery*. Operative Clinics:
Gastrointestinal Surgery—Vagotomy and Gastroenterostomy. JACK M. FARRIS and ASSOCIATES.
Two Team Abdominal Perineal. MALCOLM R. HILL and ASSOCIATES.
Gastric Resections. WILLIAM F. QUINN, NORMAN L. CARDEY.

Wednesday

8:00–12:00. *General Surgery*. Operative Clinics:
Carcinomas of Face, Neck, and Breast. Los Angeles Tumor Institute Staff.
Carcinoma of the Stomach. LEWIS A. ALESEN.
Thoracic Surgery. Operative Clinic:
Carcinoma of Lung. LYMAN A. BREWER and ASSOCIATES.

Thursday

8:00–12:00. *General Surgery*. Operative Clinics:
Lesions of Thyroid. O. DALE LLOYD.
Cholecystic Disease. WILLIAM HENRY OLDS and ASSOCIATES.
Hernioplasty. FREDERICK W. LEIX and ANTON LAUBERSHEIMER.

Friday

8:00–12:00. *Obstetrics and Gynecology*. Operative Clinics:
Total Hysterectomy. DONALD G. TOLLEFSON and ASSOCIATES.
Vaginal Hysterectomy. PAULA HORN and ASSOCIATES.
Total Hysterectomy. WILLIAM H. BROWNFIELD and ASSOCIATES.
Low Cervical Section and other Gynecological Procedures. RALPH J. THOMPSON, GEORGE W. HEWITT and AARON NEAL WEBB.

CEDARS OF LEBANON HOSPITAL, LOS ANGELES

Tuesday

10:00–12:00. *General Surgery*. Operative Clinic: Thyroidectomy. MAURICE G. KAHN, MAX W. BAY.
10:00–12:00. *Gynecology*. Operative Clinic: Selected cases. EMIL J. KRAHULICK.
10:00–12:00. *Genitourinary Surgery*. Operative Clinic: Selected cases. JAMES STEINBERG.

Wednesday

10:00–12:00. *General Surgery*. Operative Clinic: Smithwick operation. MARCUS H. RABWIN.
10:00–12:00. *Neurosurgery*. Operative Clinic: Selected cases. TRACY PUTNAM.

Thursday

10:00–12:00. *General Surgery*. Operative Clinic: Abdominal surgery. ISAAC Y. OLCH.
10:00–12:00. *Gynecology*. Operative Clinic: Selected cases. JOSEPH M. HARRIS, LEON KROHN.
10:00–12:00. *Genitourinary Surgery*. Operative Clinic: Selected cases. JAMES STEINBERG.

Friday

10:00–12:00. *General Surgery*. Operative Clinic: Selected cases. SAM S. HERZIKOFF.
10:00–12:00. *Thoracic Surgery*. Operative Clinic: Selected cases. ALFRED GOLDMAN.

Tuesday through Friday

10:00–12:00. *General Surgery.* Nonoperative Clinics: Smithwick Operation; Colectomy; Gall Bladder; Thyroid; Roentgenology; Pathology. MARCUS H. RABWIN, DAVID H. ROSENBLUM, MAX W. BAY, ISAAC Y. OLCH, Members of Thyroid Committee, EUGENE FREEDMAN, N. FRIEDMAN.

CHILDREN'S HOSPITAL, LOS ANGELES

Monday

Thoracic Surgery. Operative Clinics:
Blalock Operation; Bronchoscopies. JOHN C. JONES.
Oral Surgery. Operative Clinics:
Cleft Palates; Cleft Lips. EMIL F. THOLEN.
Orthopedic Surgery. Operative Clinics:
Hip Fusion; Triple Arthrodesis; Biopsy of Knee. JOHN C. WILSON.
11:00–12:00. *Thoracic Surgery.* Nonoperative Clinics:
Patent Ductus Arteriosis; The Blalock Operation.

Tuesday

Otolaryngology. Operative Clinics:
Tonsillectomy and Adenoidectomy; Mastoidectomy. ALDEN MILLER.
Plastic Surgery. Operative Clinics:
Padgett's Grafts; Reconstruction Ears; Excision of Nevus with Graft. WILLIAM S. KISKADDEN.
Ophthalmology. Operative Clinics:
Recession and Resection; Tuck and Recession; O'Connor Cinch; Ptosis, Motais'. A. RAY IRVINE.
11:00–12:00. *Plastic Surgery.* Nonoperative Clinic:
Immediate and Late Results Obtained in the Treatment of Burns.

Wednesday

General Surgery. Operative Clinics:
Herniorrhaphy; Orchiopexy; Appendectomy; Thyroglossal Cyst. LAWRENCE CHAFFIN.
Thoracic Surgery. Operative Clinics:
Coarctation; Patent Ductus. JOHN C. JONES.
11:00–12:00. *General Surgery.* Nonoperative Clinic:
General Pediatric Problems in Childhood.

Thursday

Genitourinary Surgery. Operative Clinics:
Nephrectomy; Bladder Neck Resection; Cystoscopies. O. W. BUTLER.
Orthopedic Surgery. Operative Clinics:
Spinal Fusion; Arthrodesis (Britton type). JOHN C. WILSON.
Proctology. Operative Clinic:
Rectovaginal Fistula. KENNETH E. SMILEY.
Endoscopy. Operative Clinics:
Bronchoscopy; Laryngoscopy. ALDEN MILLER.
Neurosurgery. Operative Clinics:
Cerebellar Exploratory; Choroid Plexectomy; Boneflap. CARL W. RAND.
11:00–12:00. *Orthopedic Surgery.* Nonoperative Clinic:
Clinical Diagnostic Problems.
Neurology. Nonoperative Clinic:
Brain Tumors in Childhood.

Friday

Otolaryngology. Operative Clinic:
Tonsillectomy and Adenoidectomy. ALDEN MILLER.
General Surgery. Operative Clinics:
Pyloroplasty; Herniorrhaphy. WILLIAM J. NORRIS, JAMES NORTON NICHOLS.
Ophthalmology. Operative Clinics:
Recession and Resection; Enucleation; Ptosis. A. RAY IRVINE.
11:00–12:00. *Ophthalmology.* Nonoperative Clinic:
Squint and Muscle Surgery.
Otolaryngology. Nonoperative Clinic:
Acute Obstructive Laryngitis.

FRENCH HOSPITAL, LOS ANGELES

Wednesday

10:30–10:50. *Tumor Surgery.* Nonoperative Clinic: Radical Cancer Surgery of Head and Neck—slides—cases. SAM L. PERZIK.
10:50–11:10. *Tumor Surgery.* Nonoperative Clinic: Combined Attack of Cancer of Head and Neck—slides—cases. CLYDE K. EMERY.
11:10–11:20. *Tumor Surgery.* Nonoperative Clinic: Benign Tumors of Neck—slides. ALOIS POLLAK.
11:20–11:30. *General Surgery.* Nonoperative Clinic: Removal of Thyroglossal Duct Cyst—motion pictures. ELMER J. BALL.

Wednesday Afternoon

Round Table Discussion. ARTHUR J. MENDENHALL, FRED GASPARD, IVO LOPIZICH, VICTOR CEFALU, PIERRE PAUL VIOLE.

HOLLYWOOD PRESBYTERIAN HOSPITAL—OLMSTED MEMORIAL

Tuesday

8:00–12:00. *Tumor Surgery.* Nonoperative Clinic:
Cases Presented with Followup. C. HIRAM WEAVER and STAFF.

Wednesday

8:00–10:00. *Tumor Surgery.* Operative Clinic:
Radical Mastectomy with Cautery. C. HIRAM WEAVER and STAFF.
8:00–12:00. *Genitourinary Surgery.* Operative Clinic:
Urological Surgery. STAFF.
8:00–12:00. *General Surgery.* Operative Clinics:
Thyroidectomy; Gastric Resection; Lobectomy. STAFF.
10:00–11:00. *General Surgery.* Nonoperative Clinic:
Nonsurgical treatment for Genital Relaxation Including Urinary Incontinence, with Exhibit. ARNOLD H. KEGEL.
10:00–12:00. *General Surgery.* Nonoperative Clinic:
Traumatic Injuries to Abdomen. DONALD C. COLLINS.

Thursday

8:00–12:00. *General Surgery.* Operative Clinic:
Selected Cases. STAFF.
9:00–10:00. *Plastic Surgery.* Operative Clinic:
Mastopexy. HERBERT OTTO BAMES.
10:00–12:00. *Plastic Surgery.* Nonoperative Clinic:
Demonstration Plastic Technique. HERBERT OTTO BAMES.

HOSPITAL OF THE GOOD SAMARITAN, LOS ANGELES

Tuesday

8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. LAWRENCE CHAFFIN, WILLIAM J. NORRIS.
8:00–12:00. *Thoracic Surgery,* Operative Clinic: Selected Cases. JOHN C. JONES.
8:00–12:00. *Neurosurgery,* Operative Clinic: Selected Cases. GEORGE H. PATTERSON.

Wednesday

8:00–12:00. *General Surgery*, Operative Clinic: Selected Cases. PHILIP J. CUNNANE.
8:00–12:00. *Genitourinary Surgery*, Operative Clinic: Selected Cases. KENNETH E. SMILEY.
8:00–12:00. *Neurosurgery*, Operative Clinic: Selected Cases. CARL W. RAND.
9:00–12:00. *Ophthalmology*, Operative Clinic: Selected Cases. GEORGE P. LANDEGGER.

Thursday

8:00–12:00. *General Surgery*, Operative Clinic: Selected Cases. CLARENCE J. BERNE, JAMES N. NICHOLS, KENNETH W. BLAKE.
8:00–12:00. *Thoracic Surgery*, Operative Clinic: Selected Cases. FRANK S. DOLLEY.
Otorhinolaryngology, Operative Clinic: Selected Cases. P. SHUMAKER.

Friday

8:00–12:00. *General Surgery*, Operative Clinic: Selected Cases. LAWRENCE CHAFFIN.
8:00–12:00. *Genitourinary Surgery*, Operative Clinic: Selected Cases. WILLIAM H. KIGER.
8:00–12:00. *Gynecology*, Operative Clinic: Selected Cases. HENRY M. SHAW.
8:00–12:00. *Orthopedic Surgery*, Operative Clinic: Selected Cases. JOHN C. WILSON.

COLLIS P. AND HOWARD HUNTINGTON MEMORIAL HOSPITAL, PASADENA

Tumor Surgery. Operative Clinic:
Selected Cases. GEORGE S. SHARP, EUGENE W. DEMAREE.
Plastic Surgery. Operative Clinic:
Correction of Burn Contractures. GEORGE V. WEBSTER.
Gas Therapy. Operative Clinic:
Application of Intermittent Positive Pressure Breathing for Control of Respiratory Depression. JOHN B. DILLON.
Orthopedic Surgery. Operative Clinic:
Early Recognition and Treatment of Congenital Hips. JOSEPH CHARLES RISSER.
General Surgery. Operative Clinic:
Abdominal Surgery in the Aged and Portacaval Anastomoses in Cirrhosis of the Liver. ARTHUR C. PATTISON.
Pathology. Nonoperative Clinic:
Tumors and Cysts of the Ovary—A Pathologic Demonstration. ALVIN G. FOORD.
General Surgery. Nonoperative Clinic:
The Cardiac Risk in Surgery. GEORGE GRIFFITH.
Tumor Surgery. Nonoperative Clinic:
Tumor Clinic Demonstration—Selected Cases to Show the Operation of a Diagnostic Tumor Clinic in a Voluntary Hospital. EDWARD D. KREMERS and STAFF.

LOS ANGELES COUNTY HOSPITAL, LOS ANGELES

Monday

9:00 *General Surgery*. Nonoperative Clinics:
Symposium on Esophageal and Gastric Disease. HAROLD LINCOLN THOMPSON.
Surgery of Carcinoma of the Esophagus. LYMAN A. BREWER.
Hiatus Hernia, Surgical Management. JOSEPH L. ROBINSON.
Vagus Resection in Treatment of Peptic Ulcer. JOSEPH A. WEINBERG.
Surgical Management of Massive Hemorrhage from the Upper Gastrointestinal Tract. E. ERIC LARSON.
The Need of More Radical Surgery in Gastric Carcinoma. HAROLD LINCOLN THOMPSON.

Tuesday

8:00 *Genitourinary Surgery*. Operative Clinics:
Intravesical Retropubic Prostatectomy. TRACY O. POWELL.
Transurethral Prostatic Resection. ROGER W. BARNES.
Thoracic Surgery. Operative Clinic:
Pneumonectomy. FRANK S. DOLLEY, LYMAN A. BREWER.
Thoracic Surgery. Nonoperative Clinic:
Discussion on Problems of Anesthesia in Thoracic Surgery. JOHN DILLON.
Tumor Surgery. Operative Clinic:
The Commando Type of Operation for Carcinoma of the Floor of the Mouth. SAMUEL L. PERZIK, LEWIS W. GUISS.
Discussion during surgery of the Problem of Intraoral Cancer. IAN MACDONALD.
General Surgery. Operative Clinics:
Radical Mastectomy. LAWRENCE CHAFFIN.
Discussion during surgery. PHILIP J. CUNNANE.
Thyroidectomy. PHILIP J. CUNNANE.
Discussion during surgery. LAWRENCE CHAFFIN.
Portacaval Shunt. ARTHUR C. PATTISON.
Discussion during surgery. WILLIAM H. SNYDER.
Cholecystectomy. WILLIAM H. SNYDER.
Discussion during surgery. ARTHUR C. PATTISON.
9:30. *General Surgery*. Nonoperative Clinics:
Thyroid Symposium. CONRAD J. BAUMGARTNER, Moderator.
Hazards of Thyroidectomy. LEWIS F. ELLMORE.
Organic Blood Iodine Levels Observed in Diagnosis and Treatment of Thyroid Disease. EUGENE J. JOERGENSON.
The Problem of the "Aberrant Thyroid." CLARENCE J. BERNE.
The Newer Anti-Thyroid Drugs. PAUL STARR.
The Use of Radioactive Iodine in the Treatment of Thyroid Disease. MYRON PRINZMETAL.
Genitourinary Surgery. Nonoperative Clinics:
Discussion of Methods of Prostatectomy. TRACY O. POWELL, Moderator.
Endoscopic Identification of Tissue during Transurethral Prostatic Resection (lantern slide demonstration). ROGER W. BARNES, Moderator.
10:00. *Genitourinary Surgery*. Operative Clinics:
Nephrolithotomy. ADOLPH A. KUTZMANN.
Transurethral Resection of Bladder Tumor. R. THEODORE BERGMAN.
11:30. *Genitourinary Surgery*. Nonoperative Clinics:
Discussion of Renal Surgery for Stone. ADOLPH A. KUTZMANN.
Discussion of Endoscopic Treatment of Bladder Tumor. R. THEODORE BERGMAN.

Wednesday

8:00–12:00. *General Surgery*. Operative Clinic:
Gastric Resection. E. ERIC LARSON.
Discussion during surgery. CLARENCE J. BERNE.
General Surgery. Nonoperative Clinic:
Problem of Gastric Surgery in a Private Hospital; Types of Resection; Operative Morbidity and Mortality; Results.
General Surgery. Operative Clinics:
Common Duct Stone. CLARENCE J. BERNE.
Discussion during surgery. JOHN R. PAXTON.
Vagotomy and Gastroenterostomy. EUGENE J. JOERGENSON.

Results of Vagotomy at Los Angeles County General Hospital. HARRY C. PROUT.

General Surgery. Nonoperative Clinic:
Causes of Upper Gastro-intestinal Bleeding (illustrated). HAROLD LINCOLN THOMPSON.

General Surgery. Operative Clinic:
Resection of Lesion of Cardiac End of Stomach. HAROLD LINCOLN THOMPSON.
Discussion during surgery. EUGENE J. JOERGENSON.

General Surgery. Nonoperative Clinic:
Problems of Anesthesia in Thoracicoabdominal Approach to Cardiac End of Stomach. JOHN B. DILLON.

Proctology. Operative Clinics:
Repair of the Incontinent Anal Sphincter. PAUL C. BLAISDELL.
Anal Fissure. PAUL C. BLAISDELL.
Abdominoperineal Resection—Two-team. MALCOLM R. HILL and ASSOCIATES.

Obstetrics and Gynecology. Operative Clinics:
Vaginal Hysterectomy. CARL E. KRUGMEIER.
Discussion during surgery. WILLIAM C. BRADBURY.
Total Hysterectomy. WILLIAM C. BRADBURY.
Discussion during surgery. CARL E. KRUGMEIER.

Orthopedic Surgery. Operative Clinics:
Spinal Fusion. JOSEPH CHARLES RISSER.
Discussion during surgery. G. MOSSER TAYLOR.
Intratrochanteric Fracture, The Neufeld Nail. G. MOSSER TAYLOR.
Discussion during surgery. ALONZO J. NEUFELD.

Orthopedic Surgery. Nonoperative Clinics:
Discussion between cases—Anatomical Considerations of the Region of the Hip. CHRISTOPHER MASON, Moderator.
Problems of Anesthesia. JOHN B. DILLON.

9:30. *Tumor Surgery*. Nonoperative Clinics:
Malignancy Symposium. IAN MACDONALD, Moderator.
Combined Procedures for Intraoral Cancer with Cervical Metastases. LEWIS W. GUISS, SAMUEL L. PERZIK.
Detection and Management of Biologically Inoperable Mammary Carcinoma. LEO M. LEVI.
Diagnosis and Treatment of Uterine Carcinoma (Cervix, Corpus). JUSTIN J. STEIN.

Thursday

8:00–12:00. *Obstetrics and Gynecology*. Operative Clinics:
Suspension of Vaginal Vault from Abdominal Route. HENRY N. SHAW.
Manchester Operation. HAROLD K. MARSHALL.
Presacral Neurectomy. ERLE HENRIKSEN.

Genitourinary Surgery. Operative Clinics:
Nephrectomy (with discussion). JAY J. CRANE.
Retropubic Prostatectomy. SAMUEL K. BACON, FREDERICK A. BENNETTS.
Perineal Prostatectomy. CARL F. RUSCHE, DONALD A. CHARNOCK.

Thoracic Surgery. Operative Clinic:
Lobectomy. JOSEPH L. ROBINSON.
Discussion during surgery. JOHN C. JONES.

Neurosurgery. Operative Clinics:
Thoracolumbar Sympathectomy. RUPERT B. RANEY, GEORGE H. PATTERSON.
Cervical Disc. AIDAN A. RANEY, HERBERT G. CROCKETT.
Brain Tumor. PHILIP J. VOGEL, FRANK M. ANDERSON.
Supradiaphragmatic Sympathectomy (Peet Operation). EMIL SELETZ, HENRY MICHAEL CUNEO.

General Surgery. Operative Clinic:
Thyroidectomy. CLARENCE E. STAFFORD.
Discussion of Thyroid Problems. CONRAD J. BAUMGARTNER.

General Surgery. Nonoperative Clinic:
Discussion—Differential Diagnosis of Tumor of the Neck (Illustrated with charts and models).

General Surgery. Operative Clinic:
Branchial Fistulectomy. CONRAD J. BAUMGARTNER.
Discussion of Congenital Lesions of the Neck. CLARENCE E. STAFFORD.

9:30. *Orthopedic Surgery*. Nonoperative Clinic:
Fractures. VERNON P. THOMPSON, Moderator.
Fractures and Dislocations of the Hip; Fracture of the Femur; Fracture of the Tibia. SAMUEL S. MATTHEWS, PAUL E. MCMASTER, G. MOSSER TAYLOR, ALONZO J. NEUFELD.

Friday

8:00–12:00. *Proctology*. Operative Clinics:
Abdominoperineal Resection. ROBERT L. BELT, WILLIAM H. DANIEL.
Fistulectomy.
Hemorrhoidectomy.
Anal Ulcer Excision.

Orthopedic Surgery. Operative Clinics:
Amputation. FRANCIS M. MCKEEVER.
Open Reduction Fractured Tibia. PAUL E. MCMASTER.
Osteotomy of Hip. VERNON P. THOMPSON.
Discussion between cases.

Tumor Surgery. Operative Clinic:
Radical Mastectomy. EUGENE J. JOERGENSON.
Discussion of Cancer of Breast. JUSTIN J. STEIN.

Tumor Surgery. Nonoperative Clinic:
Biopsy Techniques—Discussion between cases. CLARENCE E. NELSON.

Tumor Surgery. Operative Clinic:
Radical Neck Dissection. JUSTIN J. STEIN.
Discussion during surgery. CLARENCE E. NELSON, EUGENE J. JOERGENSON.

General Surgery. Nonoperative Clinic:
Anatomy of Inguinal and Femoral Regions (Demonstration with charts). COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Operative Clinic:
Surgical Repair of Indirect Inguinal Hernia. COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Nonoperative Clinic:
Survey of Hernia Repair, McCornack General Hospital and Los Angeles County General Hospital from June, 1946 to June, 1948 (charts and discussion). COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Operative Clinic:
Surgical Repair of Direct Inguinal Hernia. COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Nonoperative Clinic:
General Discussion of Anesthesia in Elective and Emergency Surgical Procedures for Repair of Hernia. JOHN B. DILLON.

General Surgery. Operative Clinic:
Surgical Repair of Femoral Hernia. COL. LAWRENCE BALL, GORDON K. SMITH.
General Discussion.

General Surgery. Operative Clinic:
Obstructive Jaundice (Stone Common Duct). JAMES NORTON NICHOLS.
General Discussion. LEWIS A. ALESEN.

General Surgery. Nonoperative Clinic:
Discussion between cases—The Problem of Diagnosis of the Acute Abdomen in Children (illustrated). JAMES NORTON NICHOLS.

General Surgery. Operative Clinic:
Subtotal Gastrectomy Illustrating Use of Alesen Tube. LEWIS A. ALESEN.

Discussion during surgery. JAMES NOPTON NICHOLS.

General Surgery. Nonoperative Clinic:
Symposium on Fluid, Nitrogen, and Electrolyte Balance. CLARENCE J. BERNE Moderator.
General Review of Current Concepts. JACK M. FARRIS.
Discussion of Nitrogen Balance. HARRY A. DAVIS.
Discussion of Acid-Base Balance. RALPH E. HOMANN.
Presentation of Illustrative Cases. HELEN E. MARTIN.

METHODIST HOSPITAL OF SOUTHERN CALIFORNIA, LOS ANGELES

Monday

8:00–12:00. *Thoracic Surgery.* Operative Clinic: Selected Cases. LYMAN A. BREWER, FRANK S. DOLLEY.
8:00–12:00. *Tumor Surgery.* Operative Clinic: Selected Cases. CLYDE EMERY TUMOR GROUP, SAMUEL L. PERZIK.
8:00–12:00. *Orthopedic Surgery.* Operative Clinic: Selected Cases. HAROLD E. CROWE, KENNETH TOWNSEND.
8:00–12:00. *Ophthalmology and Otolaryngology.* Operative Clinic: Selected Cases. WALTER R. CRANE.

Friday

8:00–12:00. *Genitourinary Surgery.* Operative Clinic: Selected Cases. FREDERICK A. BENNETTS, CARL L. MULFINGER.
8:00–12:00. *Obstetrics and Gynecology.* Operative Clinic: Selected Cases. ALEX A. BLATHERWICK, CARL E. KRUGMEIER, ELDON W. TICE.
8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. CLIFFORD O. BISHOP, GEORGE R. DUNLEVY, LEWIS F. ELLMORE, ADOLPH M. HANSEN, ELMER A. NELSON, ROY E. SHIPLEY, JOSEPH A. PARKER, HAROLD P. TOTTEN.
8:00–12:00. *Hand Surgery.* Operative Clinic: Selected Cases. JOSEPH H. BOYES.

ORTHOPAEDIC HOSPITAL, LOS ANGELES

Monday

8:00–11:00. *Orthopedic Surgery.* Operative Clinic: Spinal Fusion for Scoliosis. JOSEPH CHARLES RISSER.

Wednesday

8:00–10:00. *Orthopedic Surgery.* Operative Clinic: Fascial Transplants. CHARLES LOWMAN.

Thursday Morning

10:00–12:00. *Orthopedic Surgery.* Nonoperative Clinic: Surgical Conference. HAROLD E. CROWE.

Every Afternoon

Orthopedic Surgery. Nonoperative Clinic.

PHYSICIANS AND SURGEONS HOSPITAL, GLENDALE

Days not yet decided

8:30–12:00. *Gynecology.* Operative Clinic: Vaginal Plastic Procedures. HAROLD K. MARSHALL.
8:30–12:00. *General Surgery.* Operative Clinic: Two-Team Abdominoperineal Resection of Rectum. ELMER BELT.
8:30–12:00. *General Surgery.* Operative Clinic: Resection Carcinoma of Esophagus or Transthoracic Vagotomy. HAROLD LINCOLN THOMPSON.
Orthopedic Surgery. Nonoperative Clinic:
Knee Surgery. HUGH T. JONES.
Orthopedic Surgery. Nonoperative Clinic:
Surgical Treatment of Fractures—motion pictures. CHARLES W. GILFILLAN.
Orthopedic Surgery. Nonoperative Clinic:
Internal Fixation of Fractures. JOSEPH WOLF.
Orthopedic Surgery. Nonoperative Clinic:
Backache. JOHN R. BLACK.
Gynecology. Nonoperative Clinic:
General Vaginal Prolapse. HAROLD K. MARSHALL, DANSON TARR, MATT STURDEVANT.

QUEEN OF ANGELS HOSPITAL, LOS ANGELES

Tuesday

8:00–11:00. *Otorhinolaryngology and Ophthalmology.* Operative Clinics:
Fenestration Operation. HOWARD P. HOUSE.
Laryngectomy. ALDEN MILLER.
Nasoplastic Operation. JOSEPH GAYNOR.
Strabismus: Demonstration of the O'Connor Cinch Operation and Recession of the Inferior Oblique Muscle. ALFRED ROBBINS.
Cataract; Extraction by the Castroviejo Suction Technique. MAURICE NUGENT.
Combined Extraction. STEPHEN POPOVICH.
Glaucoma; Decompression Operation. IRVING SCHUMAN.
10:00–12:00. *Orthopedic Surgery.* Operative Clinic:
Sympathectomy for Peripheral Vascular Disease. EDWIN PLIMPTON.
11:30–1:00. *Otorhinolaryngology and Ophthalmology.* Nonoperative Clinics:
Illustrated Lecture on Acute Obstructive Laryngitis. ALDEN MILLER.
Deafness in Children Treated by Radiation. LAWRENCE GUNDRUM.
Sclerotic Mastoid and its Roentgen Interpretation. GILBERT OWEN.
The Treatment of Corneal Scars by Beta Irradiation. WILLIAM H. BOYD.
The Tuohy Corneal Lens. MAURICE NUGENT.
Complication Following Cataract Extractions. IRVING SCHUMAN.
The Scleral Shortening Operation for Detachment of the Retina. (Motion picture in color). W. E. BORLEY.
Essential Hypertension and its Ophthalmoscopic Interpretations. STEPHEN POPOVICH.

Wednesday

8:00–11:00. *Obstetrics and Gynecology.* Operative Clinics:
Total Hysterectomy. FRANK F. SCHADE.
Vaginal Hysterectomy. SAMUEL MARTINS.
Vaginal Plastic Operation for Correction Cystocele, Rectocele and Laceration of Pelvic Floor. H. NIEBERGALL.
Vaginal Plastic Operation for Correction of Stress Incontinence of Urine (Kennedy Procedure). DANIEL MISHELL.
8:00–11:00. *General Surgery.* Operative Clinics:
Diaphramatic Hernia, Thoracic Approach. J. N. O'NEILL.
Gall Bladder. ROBERT STEWART.
8:00–11:00. *Orthopedic Surgery.* Operative Clinics:
Herniated Disc. CHRISTOPHER MASON.
Pinning of Fracture of Neck of Femur. FRED ILFELD.
Arthrotomy for Benign Tumor. JOSEPH PELUSO.
11:30–1:00. *Obstetrics and Gynecology.* Nonoperative Clinics:
Pregnancy Following Conservative Treatment for Pelvic Endometriosis. DANIEL MISHELL and UMBERT E. ANZ.

Early Rupture of the Uterus Before the Onset of Labor. A. M. McCarthy and C. V. Von der Ahe.
Low Spinal Anesthesia in Obstetrics. A Report of 2,000 cases. Frank F. Schade and William Caldwell.

Thursday

8:00–11:00. *General Surgery*. Operative Clinics:
Thyroidectomy. Walter Sullivan and Tenero D. Caruso.
Radical Mastectomy. Donald E. Ross.
Abdominal Perineal Resection of Rectum. William Daniel.
Colon Surgery. James L. Neller and D. A. Gazzaniga.
8:00–11:00. *Orthopedic Surgery*. Operative Clinics:
Intermedullary Pinning of Fracture. Anterior Approach to Elbow Joint. Homer Pheasant.
Osteotomy and Fixation of Non-Union of Neck of Femur by a New Reverse Nail. Gale Hunt.
Subcutaneous Faciotomy for Dupuytren's Traction. J. Vernon Luck.
11:30–1:00. *Orthopedic Surgery*. Nonoperative Clinics:
End Results of Intermedullary Pinning of Fracture. Alfred Gallant.
Slipped Upper Femural Epiphysis. Gale Hunt.
Subcutaneous Faciotomy (Motion picture). J. Vernon Luck.
Reconstruction of Elbow Injuries. Homer Pheasant.

Friday

8:00–11:00. *General Surgery*. Operative Clinics:
Tractotomy for Tic Douloureux. Rupert B. Raney.
Gall Bladder Surgery. Walter Holleran.
Carcinoma of Bladder. Fred Bennetts.
Partial Gastroctomy. James F. Regan.
Resection Carcinoma of Esophagus. Frank S. Dolley and Lyman Brewer.
Retropubic Prostatectomy. Morton M. Mayers.
Thyroidectomy. Daniel Fortmann.
11:30–1:00. *General Surgery*. Nonoperative Clinics:
Radical Mastectomy (Motion picture in sound and color). Donald E. Ross.
Mastopexy (Motion picture in color). Joseph Gaynor.
Sympathectomy (Motion picture). Rupert B. Raney.
Diabetes Mellitus Complicating Surgery. Kendrick Smith.

ST. JOHN'S HOSPITAL, SANTA MONICA

Monday

8:00–10:00. *General Surgery*. Operative Clinic: Surgery of the Gallbladder. Roderick M. Neale.
8:00–10:00. *Obstetrics and Gynecology*. Operative Clinic: Cesarean Section (Bi-cornuate Uterus). B. H. Watson.
10:00–12:00. *General Surgery*. Operative Clinic: Surgery of the Colon. G. Arnold Stevens.
10:00–12:00. *Orthopedic Surgery*. Operative Clinic: Laminectomy with Spinal Fusion. Daniel H. Levinthal.

Tuesday

8:00–10:00. *General Surgery*. Operative Clinic: Thyroidectomy. G. Arnold Stevens.
8:00–10:00. *Obstetrics and Gynecology*. Operative Clinic: Anterior and Posterior Colpoperineoplasty and Kelly Stitch. James C. Doyle and Aloysius C. Mietus.
10:00–12:00. *General Surgery*. Operative Clinic: Gastric Resection. Marcus H. Rabwin and David H. Rosenblum.
10:00–12:00. *Orthopedic Surgery*. Operative Clinic: Arthrotomy of the Knee. Daniel H. Levinthal.

Wednesday

8:00–10:00. *General Surgery*. Operative Clinic: Radical Mastectomy. John F. Roberts.
8:00–10:00. *Genitourinary Surgery*. Operative Clinic: Retro-pubic Prostatectomy. Gilbert J. Thomas and Fred C. Schlumberger.
10:00–12:00. *General Surgery*. Operative Clinic: Vagotomy and Posterior Gastroenterostomy. Francis E. Browne and Henry J. Lange.
10:00–12:00. *Plastic Surgery*. Operative Clinic: Rhinoplasty. J. J. Pressman.

Thursday

8:00–10:00. *General Surgery*. Operative Clinic: Herniorrhaphy (Tantalum Gauze and Tantalum Wire). Marcus H. Rabwin and David H. Rosenblum.
8:00–10:00. *Obstetrics and Gynecology*. Operative Clinic: Total Hysterectomy. B. H. Watson.
10:00–12:00. *General Surgery*. Operative Clinic: McVay Herniorrhaphy. Francis E. Brown and Henry J. Lange.
10:00–12:00. *General Surgery*. Operative Clinic: Exploration of Common Duct. G. Arnold Stevens.

Daily: Pathological, nonoperative clinic, Rapid Method of Surgical Tissue Diagnosis. G. H. Hummer.
Daily: Micro. Laboratory, nonoperative clinic, Photographic Aids. G. H. Hummer.

ST. JOSEPH HOSPITAL, BURBANK

Days not yet decided

General Surgery. Operative Clinic: Selected cases.

ST. LUKE HOSPITAL, PASADENA

Day not yet decided

Orthopedic Surgery. Nonoperative Clinic.
Genitourinary Surgery. Nonoperative Clinic.

ST. VINCENT'S HOSPITAL, LOS ANGELES

Tuesday

9:00–10:00. *Otolaryngology*. Operative Clinic: Selected cases. J. Mackenzie Brown.
9:00–10:00. *Ophthalmology*. Operative Clinic: Selected cases. A. Ray Irvine.
9:00–11:00. *General Surgery*. Operative Clinic: Thyroidectomy. William P. Kroger.
9:00–11:00. *General Surgery*. Operative Clinic: Selected cases. Frank J. Breslin.
9:00–12:00. *General Surgery*. Operative Clinic: Selected cases. Francis E. Browne, Henry J. Lange.
9:00–12:00. *Tumor Surgery*. Operative Clinic: Selected cases. Ian MacDonald, Lewis W. Guiss.
10:00–..... *Tumor Surgery*. Nonoperative Clinic: Malignant Lesions of Colon. Kenneth S. Davis.
10:30–..... *General Surgery*. Nonoperative Clinic: Surgery of Colon—motion pictures. William H. Daniel.
11:00–..... *General Surgery*. Nonoperative Clinic: Surgery of Esophagus—motion picture. Harold Lincoln Thompson.
11:00–1:00. *General Surgery*. Operative Clinic: Selected cases. Conrad J. Baumgartner.
11:00–1:00. *General Surgery*. Operative Clinic: Colon Surgery. Ralph V. Byrne.

Wednesday

9:00–12:00. *Orthopedic Surgery*. Operative Clinic: Selected cases. Hugh T. Jones, John R. Black.

9:00–12:00. *Orthopedic Surgery.* Operative Clinic: Selected cases. FRANCIS M. MCKEEVER.
9:00–12:00. *Neurosurgery.* Operative Clinic: Selected cases. RUPERT B. RANEY.
9:00–12:00. *Neurosurgery.* Operative Clinic: Selected cases. C. HUNTER SHELDEN.
9:00–12:00. *Otolaryngology.* Operative Clinic: Fenestration. HOWARD P. HOUSE.
9:00–12:00. *Ophthalmology.* Operative Clinic: Selected cases. JOHN P. LORDAN.
9:00–12:00. *Plastic Surgery.* Operative Clinic: Selected cases. ARTHUR E. SMITH.
10:00–..... *Tumor Surgery.* Nonoperative Clinic: Thyroid Malignancy. HENRY J. LANGE.
10:30–..... *Tumor Surgery.* Nonoperative Clinic: Struma Lymphomatosa and Fibrosis. ROBERT C. SURRIDGE.
11:00–..... *General Surgery.* Nonoperative Clinic: Obstructive Corrosive Gastritis. LOUIS C. BENNETT.

Thursday

9:00–11:00. *General Surgery.* Operative Clinic: Selected cases. E. VINCENT ASKEY.
9:00–..... *Otolaryngology.* Operative Clinic: Selected cases. JOSEPH B. STEVENS.
9:00–12:00. *Gynecology.* Operative Clinic: Selected cases. BERNARD J. HANLEY, JOHN C. MCDERMOTT.
9:00–12:00. *Proctology.* Operative Clinic: Surgery of Colon. WILLIAM H. DANIEL.
9:00–12:00. *General Surgery.* Operative Clinic: Vagus Neurectomy. EDWARD C. PALLETTE.
9:00–12:00. *Ophthalmology.* Operative Clinic: Selected cases. CLARENCE H. ALBAUGH.
10:00–..... *Orthopedic Surgery.* Nonoperative Clinic: Surgery of Hand. FRANK J. BRESLIN.
10:30–..... *Orthopedic Surgery.* Nonoperative Clinic: Surgery of Knee Joint. HUGH T. JONES, JOHN R. BLACK.
11:00–..... *Neurosurgery.* Nonoperative Clinic: Surgical Management of Intracranial Aneurysms—motion picture and lantern slide illustrations.
11:00–1:00. *General Surgery.* Operative Clinic: Selected cases. E. ERIC LARSON.

Friday

9:00–11:00. *General Surgery.* Operative Clinic: Selected cases. LOUIS C. BENNETT.
9:00–11:00. *Plastic Surgery.* Operative Clinic: Selected cases. ARTHUR E. SMITH.
9:00–12:00. *General Surgery.* Operative Clinic: Selected cases. FRANCIS E. BROWNE, HENRY J. LANGE.
9:00–12:00. *General Surgery.* Operative Clinic: Selected cases. WILLIAM P. KROGER, ROBERT C. SURRIDGE.
9:00–12:00. *Genitourinary Surgery.* Operative Clinic: Selected cases. ALBERT J. SCHOLL, EDMUND CROWLEY.
10:00–..... *General Surgery.* Nonoperative Clinic: Transthoracic Vagus Neurectomy. E. C. PALLETTE.
10:30–..... *General Surgery.* Nonoperative Clinic: Surgery of Spleen. RALPH V. BYRNE.
11:00–..... *General Surgery.* Nonoperative Clinic: Carcinoma of Tongue, or Primary Mandibular Tumors. IAN MACDONALD, LEWIS W. GUISS.
11:00–1:00. *General Surgery.* Operative Clinic: Selected Cases. DAVID A. SCHMIDT.

SANTA FE COAST LINES HOSPITAL, LOS ANGELES

Monday

9:00–11:00. *Genitourinary Surgery.* Operative Clinic: Retropubic Prostatectomy. V. J. GALLAGHER.
9:00–10:00. *Neurosurgery.* Nonoperative Clinic: The Herniated Intervertebral Disc; Discussion of Multiple Herniations. HENRY M. CUNEO.
9:00–10:00. *Otorhinolaryngology.* Nonoperative Clinic: Allergy of the Nose and Paranasal Sinuses. GORDON J. MCCURDY.

THE SANTA MONICA HOSPITAL

Thursday

9:00–11:00. *General Surgery.* Nonoperative Clinics: Traumatic Surgery. CHARLES A. LINDQUIST.
A New Method for the Movement of Fluids in the Extremities. J. P. SAMPSON and FREDERICK G. KIRBY.
Orhopedic Surgery. Operative Clinic:
Reconstructive Orthoplasty of Congenitally Dislocated Hip. WILLIAM H. WRIGHT.
Demonstration: Pre-ambulatory Diagram of Dislocated Hips. JOSEPH C. RISSER.
Contrast Orthrogram of Dislocated Hips. RALPH MILLER.

U. S. ARMY, McCORNACK GENERAL HOSPITAL, PASADENA

Friday

9:00–9:30. *Genitourinary Surgery.* Nonoperative Clinic: Amicrobic Urinary Infections. LYMAN STEWART.
9:30–10:00. *General Surgery.* Nonoperative Clinic: The Treatment of Regional Ileitis. GORDON K. SMITH.
10:00–10:30. *Plastic Surgery.* Nonoperative Clinic: Treatment of Facial Injuries. MONROE K. RUCH.
10:30–11:00. *Orthopedic Surgery.* Nonoperative Clinic: Treatment of Fracture of Forearm. VERNON J. LUCK.
11:00–11:30. *General Surgery.* Nonoperative Clinic: Hernia Repair Using Cooper's Ligament. LAWRENCE C. BALL.

U. S. NAVAL HOSPITAL, LONG BEACH

Day not yet decided

9:00–12:00. *General Surgery.* Operative Clinics: Gastrectomy. E. ERIC LARSON. Cholecystectomy. L. L. BEAN.
9:00–12:00. *Genitourinary Surgery.* Operative Clinics: Retro Pubic Prostatectomy. CARL F. RUSCHE. Varicocelectomy. MILO ELLIK and L. A. NEWTON.
9:00–12:00. *Orthopedic Surgery.* Operative Clinic: Operation for Recurrent Dislocation of the Shoulder. R. R. MYERS and JOHN M. ROWE.
9:00–12:00. *Otorhinolaryngology.* Operative Clinic: Rhinoplasty Using Cancellous Bone. E. KING, ROBERT C. BOYDEN, F. L. ASHLEY.
9:00–12:00. *Neurosurgery.* Nonoperative Clinic: Cerebral Aneurysm. ROBERT H. PUDENZ, CHAS. H. SHELDON, ARTHUR L. SCHULTZ.
9:00–12:00. *Thoracic Surgery.* Nonoperative Clinic: Carcinoma of the Lung. BERT H. COTTON and V. C. STRATTON.
1:00–4:00. *General Surgery.* Nonoperative Clinics: Ward Rounds, Follow-up on Vagus Resection and Gastric Resection. E. ERIC LARSON, RALPH V. BYRNE, WILLIAM E. DELPHY, CALVIN A. LAUER, L. L. BEAN.
1:00–4:00. *Genitourinary Surgery.* Nonoperative Clinic: Post-operative Results from High Varicocelectomy. CARL F. RUSCHE, MILO ELLIK, and L. A. NEWTON.
1:00–4:00. *Otorhinolaryngology.* Nonoperative Clinic: Motion Pictures: Nasal Bone Graft and Post-operative Results. E. KING, ROBERT C. BOYDEN, KENNETH C. BRANDENBERG.
1:00–4:00. *Neurosurgery.* Operative Clinic: Trans-frontal Craniotomy or Cervical Disc. C. HUNTER SHELDON, ROBERT H. PUDENZ, ARTHUR L. SCHULTZ.

1:00–4:00. *Thoracic Surgery.* Operative Clinic:
Pneumonectomy. BERT H. COTTON and V. C. STRATTON.
1:00–4:00. *Orthopedic Surgery.* Nonoperative Clinic:
Ward Rounds, Post Operative Care of the Orthopedic Patient. JOHN M. ROWE and R. R. MYERS, J. G. MANNING.

U. S. VETERANS ADMINISTRATION, BIRMINGHAM GENERAL HOSPITAL, VAN NUYS

Wednesday

9:00–12:00. *Genitourinary Surgery.* Nonoperative Clinics:
Results of Uretero-intestinal Implantation and Cystectomy for Carcinoma of Bladder. DONALD C. MALCOLM.
Thoracic Surgery. Operative Clinic:
Pulmonary Decortication. JOSEPH A. WEINBERG.
General Surgery. Operative Clinics:
Surgical Problems of the Paraplegic. ERNEST BORS.
Trans-Abdominal Vagotomy and Gastroejunostomy. FRANKLIN B. WILKINS.
Thoracolumbar Sympathectomy by Intercostal Approach. THEODORE B. MASSELL.
Neurosurgery. Operative Clinic: Cervical Laminectomy for Discogenic Disease. JOHN D. FRENCH.
Otorhinolaryngology. Operative Clinics: Reconstructive Rhinoplasty for Nasal Obstruction. SAMUEL KAPLAN.
Endaural Radical Mastoidectomy. SAMUEL KAPLAN.
10:00–12:00. *Orthopedic Surgery.* Nonoperative Clinics:
Care of Traumatic Injuries to the Hand. JOHN H. ALDES and JOSEPH H. BOYES.
Treatment of Bone and Joint T.B. with Streptomycin. JOHN H. ALDES.

U. S. VETERANS ADMINISTRATION CENTER, WADSWORTH GENERAL HOSPITAL, SAWTELLE

9:00–12:00. *General Surgery.* Nonoperative Clinics:
Symposia. Tetra-ethyl-ammonium in Evaluation of Peripheral Vascular Disease. C. H. MCINTYRE.
Results of Histidine and Ascorbic Acid Treatment of Peripheral Vascular Disease. RUDOLPH WIDMANN and MILTON REYNOLDS.
A New Method for the Movement of Fluids in the Extremities. F. G. KIRBY and J. P. SAMPSON (Santa Monica Hospital).
Orthopedic Surgery. Nonoperative Clinic:
Symposium: Amputations in Peripheral Vascular Disease. ROBERT MAZET.
General Surgery. Operative Clinic:
Lumbar Sympathectomy. CHARLES S. KIPEN.
Anesthesia. Operative Clinic: Pain Clinic. CHARLES F. MCCUSKEY, ERNEST WARNOCK, and NEVIN H. RUPP.
Ophthalmology and Otorhinolaryngology. Nonoperative:
9:00–9:30. Fundus Lesions with Pathological Sections and Microphotographic Slides. A. RAY IRVINE and CLAUDE S. MUMMA.
9:30–10:00. Malignancies of Ear, Nose and Throat with Case Presentations. CLAUDE S. MUMMA and STAFF.
10:00–10:30. Fenestration Operation for Otosclerosis with Case Presentations. CLAUDE S. MUMMA and STAFF.

WHITE MEMORIAL HOSPITAL, LOS ANGELES

Tuesday

9:00–12:00. *Genitourinary Surgery.* Operative Clinic:
Vesical Diverticulectomy and Urethroplasty for Urinary Incontinence. ROGER W. BARNES, R. THEODORE BERGMAN.
9:00–12:00. *Orthopedic Surgery.* Operative Clinic:
Surgical Treatment of Corns, Metatarsal Calluses, Hammer Toe, and Bunions. ALONZO J. NEUFELD and ASSOCIATES.
10:00–11:00. *Genitourinary Surgery.* Operative Clinic:
Transurethral Prostatic Resections. ROGER W. BARNES, R. THEODORE BERGMAN.
11:00–12:00. *Genitourinary Surgery.* Nonoperative Clinic:
Motion Picture Film—Transurethral Prostatic Resection. Lantern Slide Demonstration. Round table discussion. ROGER W. BARNES, Moderator.

Wednesday

9:00–12:00. *General Surgery.* Operative Clinic:
Total Excision of Parotid Gland with Preservation of Facial Nerve. CLARENCE E. NELSON and STAFF.
Obstetrics and Gynecology. Operative Clinics:
Vaginal Hysterectomy; Low Cervical Cesarean Section. RALPH J. THOMPSON and STAFF.

Thursday

9:00–12:00. *Proctology.* Operative Clinics:
Two-team Abdominal Perineal Resection for Carcinoma of the Rectum; Ano-rectal Surgery (Selected Cases). MALCOLM R. HILL and ASSOCIATES.
Otolaryngology. Operative Clinics:
Fenestration; Rhinoplasty; Endoscopic Clinic. BENTON N. COLVER and ASSOCIATES.